HELSINKI SCHOOL OF ECONOMICS
Faculty of International Business

GLOBALIZATION IMPACT ON FINNISH MECHANICAL ENGINEERING VALUE NETWORK AND SUPPLIER RESPONSE STRATEGIES

Master's Thesis
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Fall 2007

Markkinoinnin ja johtamisen laitoksen
laitosneuvoston kokouksessa 28/11 2007 hyväksytty
arvosanalla hyvä, 60p
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ABSTRACT

8.11.2007

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Objectives of the Study

The two main objectives of this study were to investigate the globalization impact on the Finnish mechanical engineering value network and to provide a model for industry suppliers to use in their response to globalization.

Summary

This study was based on the model for globalization impact on companies from West-European small and open economies, SMOPEC, and their response strategies (Gabrielsson et al., 2005). This model was built on by adding perspectives on Finnish mechanical engineering (Vesalainen, 2004, 2006), and business networks (Möller et al., 2006). Three key concepts (Gabrielsson et al. 2005) – resources, competitive advantage, and globalization impact – were reviewed in literature. Empirical data was collected through a web-based survey from managers working in Finnish mechanical engineering companies. A total of 323 respondents completed the survey, of which more than one third represented either Managing Directors or Chairmen of the Board. In addition, some mechanical engineering industry experts were interviewed to gain deeper insight.

Conclusions

The initial model of globalization impact (Gabrielsson et al., 2005) was built on by adding a new dimension – four steps to identify and fill resource and capability gaps. The four steps – eliminate, reduce, add and create – challenge mechanical engineering suppliers to question traditional industry logic and strategically differentiate themselves from competition. Through this value innovation process (Kim et al., 2005) they can build competitive advantage and respond successfully to globalization. The empirical research brought up important evidence on the strategies in use by mechanical engineering industry suppliers and buyers alike. This information was used in constructing a new value innovation based strategy for the suppliers. In general, the results show that, the impact of globalization on the Finnish mechanical engineering industry has been positive. However, domestic industry output is anticipated to go down in coming years. Also, the industry supplier segment is likely to be divided into internationalizing system suppliers and locally operating subcontractors.

Keywords

Globalization impact, response strategy, competitive advantage, value network, value innovation, mechanical engineering, system supplier, subcontractor, OEM, Finnish mechanical engineering, SMOPEC

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8.11.2007

GLOBALISAATION VAIKUTUS KONEPAJATEOLLISUUDEN ARVOVERKKOON JA ALIHANKKIJOIDEN VASTASTRATEGIAT

Tutkimukset tavoitteet

Tutkimuksen tavoitteena oli tutkia globalisaation vaikutuksia suomalaiseen konepajateollisuuden arvontuottamisverkkoon, sekä tuottaa malli alan alihankkijoille ja järjestelmätoimittajille käytettäväksi globalisaation vastastrategioiden laadinnassa.

Tiivistelmä tutkimuksesta

Tutkimus perustui Gabrielssonin ym. (2005) kehittämään malliin globalisaation vaikutuksesta länsieurooppalaisiin yrityksiin ja niiden vastastrategioihin. Tutkimus pohjautui osittain myös Vesalaisen (2004, 2006) tutkimustyölle yritysten välisestä yhteistyöstä suomalaisessa konepajateollisuudessa sekä Möllerin ym. (2006) tutkimukselle suomalaisten yritysten verkottumisesta. Teoriaosuudessa tarkasteltiin kolmeen keskeiseen konseptiin – yrityksen resursseihin, kilpailuetuun ja globalisaation vaikutuksiin – liittyviä tekijöitä. Empiirinen lähdeaineisto kerättiin sähköisen kyselyohjelmiston avulla. Aineisto muodostui 323 konepajateollisuuden kentässä toimivan vastaajan, joista kolmasosa oli joko yritysten toimitusjohtajia tai hallituksen puheenjohtajia, antamista vastauksista sekä muutamista alan asiantuntijoiden syvähaastatteluista.

Tutkimuksen tulokset

Gabrielssonin ym. (2005) globalisaatiomalli sai uuden ulottuvuuden. Neljävaiheinen toimintamalli – poista, vähennä, lisää ja luo – auttaa yrityksiä tunnistamaan ja paikkaamaan aukkoja resursseissaan ja kyvyissään. Esitetyn arvoinnovaatioon perustuvan (Kim et al., 2005) mallin avulla konepajateollisuuden alihankkijat voivat erottua kilpailijoistaan ja vastata globalisaation haasteeseen. Empiirinen tutkimus antoi arvokasta tietoa konepajateollisuuden ostavien ja myyvien yritysten strategioista. Lopputuloksena alan toimittajille oli arvoinnovaatioon perustuva globalisaation vastastrategian malli. Tulokset osoittivat, että globalisaation yleisvaikutus konepajateollisuuden arvoverkkoon on ollut positiivinen. Alan kotimaassa tapahtuvan tuotannon määrän uskotaan kuitenkin laskevan tulevina vuosina.

Avainsanat

Globalisaation vaikutus, vastastrategia, kilpailuetu, arvoinnovaatio arvoverkko, konepajateollisuus, järjestelmätoimittaja, alihankkija, OEM, suomalainen kone- ja metallituoteteollisuus

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1. INTRODUCTION

> *"Finnish mechanical engineering companies must adapt their operations knowing that they can compete successfully with the low-cost countries only by developing production processes and products to a higher degree of value added."*
>
> - Production Manager in a Finnish company producing logistical solutions for industrial material handling (survey)

> *"The fundamentals in technology industries are totally changing as the global economy is opening up and new technologies are rapidly emerging. The challenge posed by globalization and the expansion of European Union is comprehensive. It is not just a change that happens somewhere outside Finland. Internationalization (of businesses) is something that must equally take place here as well."*
>
> - Eero Hovi, Head of Research of The Finnish Metalworkers' Union (Hovi, 2007, 5)

The impact of globalization on the Finnish mechanical engineering industry seems inevitable. Companies are forced to operate in increasingly competitive and global environments. This study is motivated by the widespread concern for the future of this important industry segment.

The mechanical engineering industry, as part of the technology industries, is among the biggest employers in Finland. Technology industries directly employs 270 000 people of which 166 000 in mechanical engineering. Indirectly, the sector employes about 650 000 people, which represent about a quarter of the Finnish workforce. The sector accounts for 60 % of the exports and 75 % of the R&D investments in Finland. In 2006 the investmens in the mechanical engineering industry were worth 1,1 billion euros. It can be said that the industry is one of the cornerstones of the Finnish economy. (Hernesniemi, 2007, 19)

In the past few years, system suppliers and smaller subcontractors of the mechanical engineering industry have largely benefited from the success of Finland-based

multinationals such as Metso, Kone, Wartsila and Aker Yards. However, many of these multinationals are gradually increasing their production abroad, closer to their customers (Jurvelin, 2007, 2 – 3). Therefore, domestic system suppliers and subcontractors now face foreign competition, pressure to lower prices, cut costs and must specialize in order to keep their customer and stay in business. Many suppliers are using the opportunity to internationalize by going abroad with their key customers and establishing production facilities where the customer's manufacturing takes place.

It seems that the role of system suppliers has become more important in the value chain, as the original equipment manufacturers, OEMs, have significantly reduced the number of their suppliers (Kuikka, 2007; Sinervä, 2007, 2 - 3). It remains unclear though, whether this same trend continues into the second and third-level suppliers. Hence, it is of interest for this research to enlighten this probable change in the value chain.

In recent years, there has been a growing interest in the academic field to research the response strategies of firms from small and open economies, SMOPEC firms, use to adapt their operations to the phenomenon known as globalization (e.g. Gabrielsson & Luostarinen, 2004; Gabrielsson et al., 2005; Gabrielsson & Kirpalani, 2006). Although the effect of globalization has been extensively studied, no research has been specifically targeted at the Finnish mechanical engineering industry in this context. Considering the importance of the industry to the Finnish economy as a whole, it is surprising that there exists a research gap in this area.

Despite the research gap in the globalization impact and response strategies of Finnish mechanical engineering companies, there do exist other studies about other aspects of the industry. For example, business networks and partnerships in mechanical engineering have been researched (Vesalainen, 2004, 2006; Möller, Rajala & Svahn, 2004). Also, there is ongoing research that focuses on the growth strategies, customer relations and development paths of system suppliers in the mechanical engineering field (Pilbacka, 2007). Lastly, simultaneously with the current study, the Federation of the Technology Industries in Finland has set up a visionary committee to examine the mechanical engineering industry supplier strategical paths over the next 10-15 year term (Hernesniemi, 2007).

Furthermore, there is growing concern that the Finnish mechanical engineering industry will experience similar challenges as the Finnish electronics industry. A recent example is Perlos, a plastics supplier for the electronics industry, who lost its competitive edge of manufacturing in Finland. Martti Mäenpää, Managing Director of the Federation of the Technology Industries in Finland, has expressed this concern of many that Perlos' fate also awaits the machine building and metal products industries. (Laitinen, 2007a, B7).

1.1 Stakeholders of the Study

This section briefly introduces the two stakeholders of the study. First, the Federation of the Technology Industries in Finland provides their industry knowledge and relevant non-financial support to this study. Second, Tietoset Oy supports non-financially by providing industry contacts and knowhow.

The Federation of the Technology Industries forms the most important industrial sector in Finland. The employment effect of the sector represents a quarter of the Finnish workforce and the accounts for 60 % of the exports and 75 % of the R&D investments in Finland (Hernesniemi, 2007). The Federation of the Technology Industries in Finland oversees the interests of its members and seeks to make sure the companies have the abilities to be successful in global marketplace. For this reason, the federation supports this study.

The second stakeholder Tietoset Oy, a company created in 2005 and presently employing four people, connects the sourcing needs of industrial buyers with the competencies of system suppliers and subcontractors in the mechanical engineering industry. The researcher works as sales manager for Tietoset and has been involved in its early growth stage. The company is in the process of further developing its product to industrial buyers. At the same time, it seeks to acquire more international subcontracting companies to answer the growing demand. In this product development stage, Tietoset is looking for deeper understanding of sourcing and internationalization traits and desires of its customers. Therefore the company is interested in participating and also supporting the current study with some financing.

1.2 Definitions

This section defines terms that are central to this research. These terms are globalization, value network, globalization impact and response strategies. Furthermore, there are three categories of groups in the field, consisting of original equipment manufacturers, system suppliers, and subcontractors.

Globalization is not a straightforward term to handle and discuss. It has several meanings attached to it, but most describe a process of trends, practices, and impacts extending in a global scale. In this study, globalization is defined as the "creation and growth of globalized activities, that is, phenomena that transcend national borders, extending across, leveraging, and moving between many locations around the globe simultaneously" (Eden & Lenway, 2001).

Value network is based on the number of overlapping cooperative relationships of two actors, namely principal-agent, in a given industry. The forerunners in building value networks in manufacturing can be found in Japan, in the automobile industry in particular. Core manufacturing companies, such as Toyota, coordinate the central-most system suppliers and through these multi-layered networks of suppliers. (Möller, Rajala & Svahn, 2004)

Globalization impact refers in this study to the overall effect of globalization (Eden & Lenway, 2001) on the value network (Möller, Rajala & Svahn, 2004) in the Finnish mechanical engineering field. It would seem more difficult to specify on a single company level what the specific causes of globalization are, as there are many other factors, such as management competency, that play a role. Therefore, the impact is studied here as a combined result of several hundred companies in the mechanical engineering value network to minimize such bias.

Response strategies are defined in this study as those "proactive and reactive responses that are effective in dealing with the globalization impact" (Gabrielsson et al., 2005). Moreover, the response strategies of the study are firm-level strategies to build sustainable competitive advantage and their particular focus is on the lowest level actors in the value chain, the subcontractors.

Original equipment manufacturers, *OEMs,* are often international – sometimes even multinational or global companies that manufacture the original equipment to be sold to final customers or consumers. In this study, companies are considered OEMs if a vast majority of their turnover comes from the sale of original equipment to final customers, not from the sale of systems or subassemblies to other manufacturers. OEMs often outsource a significant proportion of the production from their suppliers. Some examples of Finnish OEMs include Tasowheel, Metso and Konecranes.

System suppliers carry out part of the assembly or component manufacturing for their direct customers, multinational enterprises, or OEMs. The centralmost important ability for the system suppliers is to develop and apply cost-effective and productive production methods. This often requires building and successfully managing a network of subcontractors, each with specialized production competencies. Presently, importance is increasingly placed on overall cost effectiveness and offering sufficient production capacity, particularly in the core markets of the customer organization (Möller et al., 2004, 202). A few examples of Finnish system suppliers are Komas, Mecanova and Mametek. In this study the companies are considered system suppliers if the vast majority of their turnover comes from selling assemblies and systems to the OEMs.

Subcontractors are defined as the manufacturers and suppliers for a certain precisely determined custom-manufactured component, so that the majority of their turnover comes from component sales to OEMs, system suppliers and other subcontractors. Because the design of components is often fairly simple, their market price is rather easily determined. Therefore, subcontracting companies often have to compete fiercely. In order to compete successfully, they must be able to cost-efficiently provide their customers high stable quality (Möller et al., 2004, 203). To achieve cost-efficiency and savings in logistics in particular, many of the subcontractors tend to be located close to their customers. Some examples of the Finnish mechanical engineering subcontractors are Myrkyn Metalli, Kellokosken Koneistus, and Arminto.

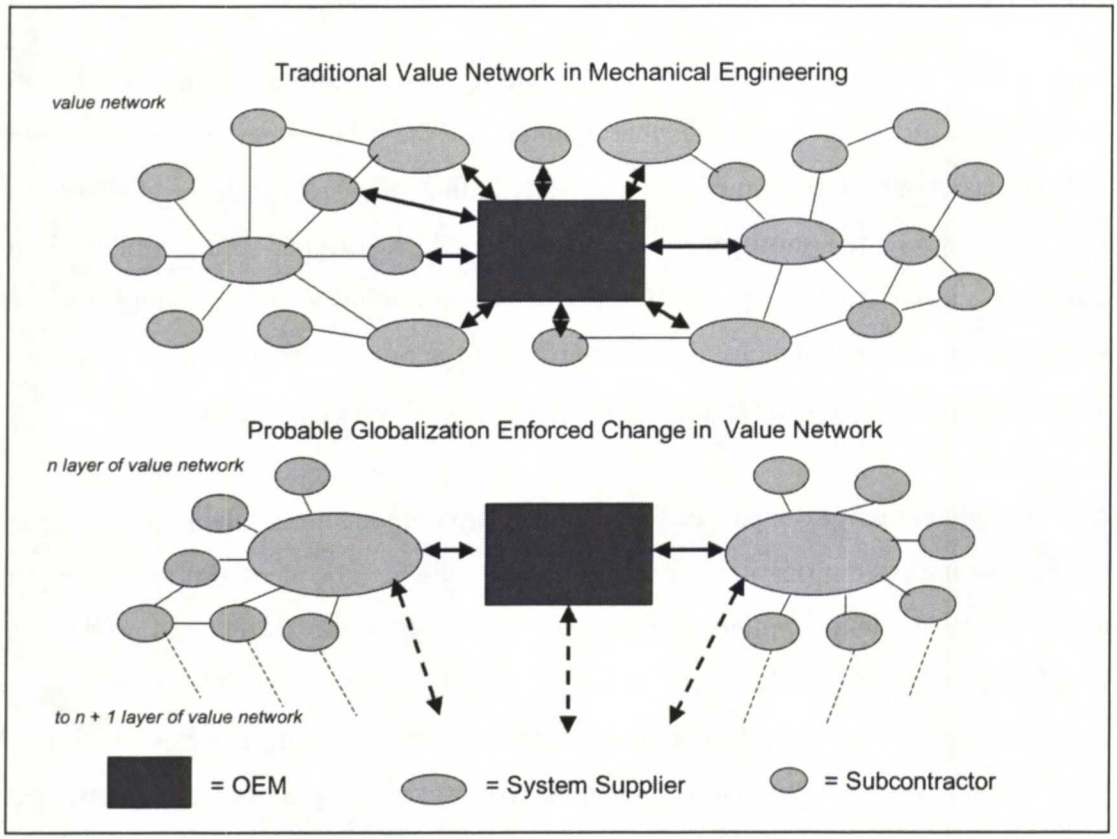

Figure 1 The Mechanical Engineering Industry Actors in the Value Network

The Figure 1 above conceptualizes the actors – OEMs, system suppliers and subcontractors – in the mechanical engineering value network. The figure also illustrates how the ongoing change from partnerships between the two companies into companies being increasingly part of a value networks is shaping the marketplace (Möller et al. 2004). It seems that OEMs are increasingly outsourcing larger proportion of component purchases to system suppliers who now have to effectively manage an increased network of subcontractors.

1.3 Defining Globalization Impact on SMOPEC Firms and Their Response Strategies

This section provides a discussion on defining globalization impact on SMOPEC (small and open economies) firms and their response strategies. This section first introduces a model of "globalization impact and SMOPEC firm response strategy". Then, the section describes how this model is revised for use in the current study.

Gabrielsson, Gabrielsson, Al-Obaidi, Salimäki, and Salonen (2005) introduced a model of "globalization impact and SMOPEC firm response strategy" that brought together the resources, capabilities, competitive advantage, and selected response strategies to the globalization impact. The model, presented below in Figure 2, conceptualizes how firms under globalization pressure form response strategies that best exploit the firm's resources and capabilities relative to external opportunities. In the process the firms may also identify resource gaps that require filling to be successful in implementing the desired response strategy (Gabrielsson et al., 2005).

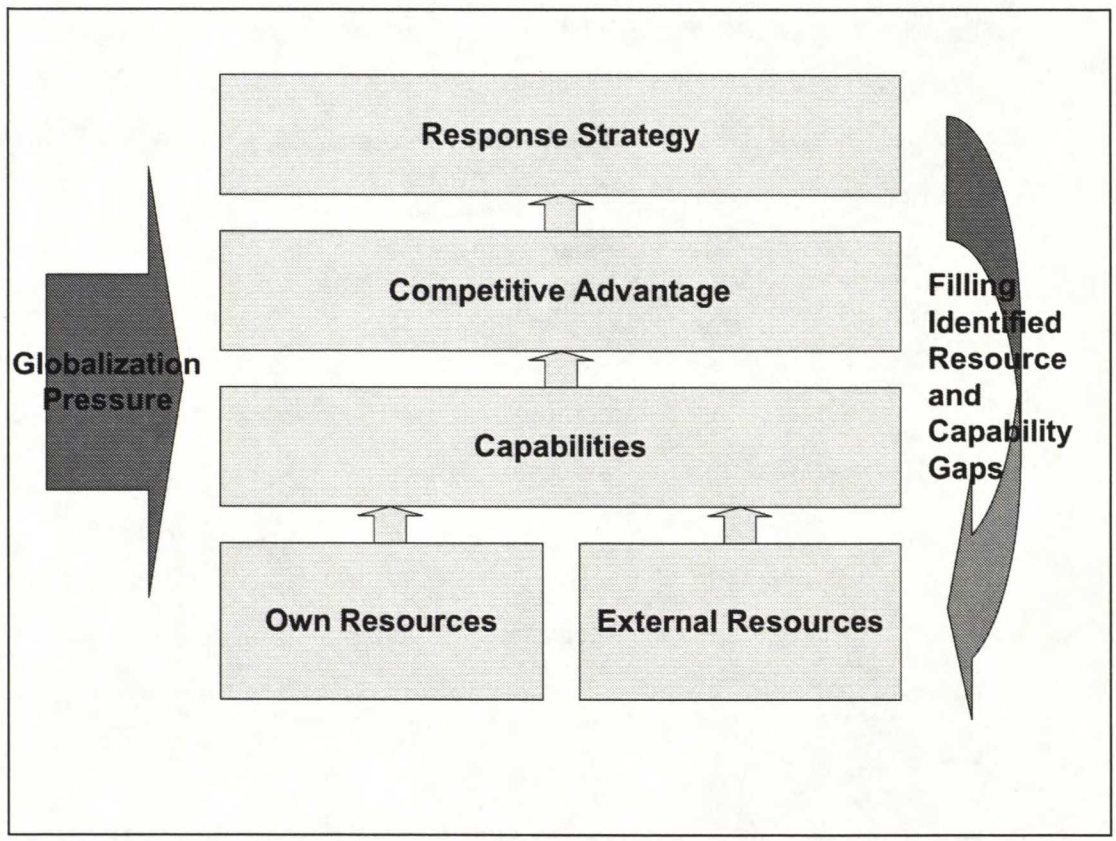

Figure 2 Globalization Impact on West-European SMOPEC Firms and Their Response Strategies (Gabrielsson et al., 2005, 12)

This study builds on the model of "globalization impact and SMOPEC firm response strategy" (Gabrielsson et al, 2005). However, the model is slightly adapted to better describe the mechanical engineering industry, and also some subelements are added to suit the purposes of the present study.

1. *Resources and capabilities* are a foundation for product strategies and thus they must have potential to be "valuable, rare, imperfectly imitable and non-

substitutable to offer sustainable competititive advantage" (Gabrielsson et al., 2005). In this study, the focus is on a) management, and b) knowhow in regard to own resources, and c) partnerships & networks, and d) customer relationships profitability in external resources.

2. *Globalization pressure* refers in this study as the overall effect of globalization (Eden & Lenway, 2001) on the value network (Möller, Rajala & Svahn, 2004) in Finnish mechanical engineering. In order to make a clear connection between pressure and its outcomes in the value network, globalization pressure is later referred to as *globalization impact* in this study. The specific globalization impacts investigated in the current study are a) customer demands, and b) competition.
3. *Competitive advantage* is a strategic weapon companies use to gain ground over rivals and innovatively differentiate themselves (Gomory et al., 2004). Competitive advantage can take many forms, for instance differentiation, cost advantage, or some other advantage occurring as the result of global integrative capabilities or location (Gabrielsson et al. 2005). In the literature review of this study, high operational efficiency, internationalization, and specialization are examined as sources of competitive advantage.

Thus, with the changes made to Gabrielsson's et al. (2005) model of globalization impact and SMOPEC firm response strategy the adjusted model for this study can be visualized as shown in Figure 3 below.

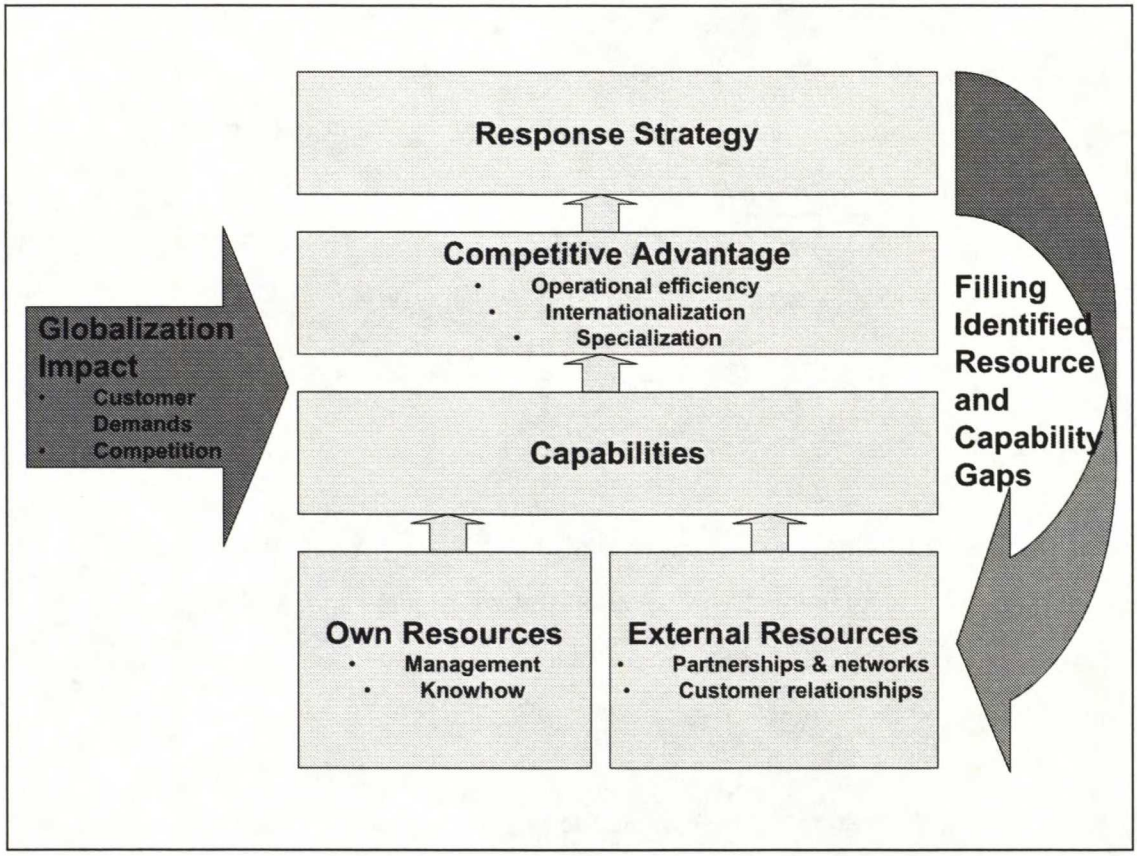

Figure 3 Adjusted model for Globalization Impact on Mechanical Engineering Value Network

The review of literature in Chapter 2 will examine the issue of globalization as well as the resources used in building competitive advantage in mechanical engineering. The elements of adjusted model are summarized as follows:

Globalization impact in Section 2.1

- *Customer demands (Kuikka, 2007; Helm, Rolfes and Günter, 2006)*
- *Competition (Gomory & Baumol, 2004; Gabrielsson et al., 2005)*

Resources in Section 2.2

- *Management importance (Koskinen, 2006; Yip, 1994)*
- *Knowhow management (Kogut & Zander, 2003; Koskinen, 2006)*
- *Partnerships and networks (Ritter & Gemünden, 2003; Vesalainen, 2004, 2006; Möller et al., 2004)*
- *Customer relationship profitability (Helm, Rolfes & Günter, 2006; Zolkiewski & Turnbull, 2002; Vesalainen, 2004)*

Competitive advantage in Section 2.3

- *Operational efficiency (Wagner & Friedl, 2007; Siiskonen, 2007)*
- *Internationalization of operations (Gemser, Brand & Sorge, 2004; Luostarinen & Gabrielsson, 2004)*
- *Specialization (Pulkkinen, Rajahonka, Siuruainen, Tinnilä & Wendelin, 2005; Eisenhardt & Martin, 2000; Möller & Svahn, 2003)*

1.4 Research Objective and Questions

This section outlines the two research questions that will guide the study towards its goal of building a globalization response strategy model for mechanical engineering companies. For both questions, an explanation is given about how the research question will be investigated in the study.

The purpose of this study is to examine the impact of globalization on the mechanical engineering value network, while also seeking to find out how subcontractors and system suppliers should respond to emerging challenges in the changing market place. Because of increasing evidence that those who acknowledge the changes in the business environment and adapt their operations to the new requirements are ultimately more successful than their competitors, this study sets out to examine how companies can succeed. More specifically, to examine how globalization is shaping the value network and what response strategies there are for domestic suppliers. The objective is to present a globalization response strategy model that can be used by the industry suppliers.

The research questions that the current study sets out to answer are twofold:

1) What is the globalization impact on the Finnish mechanical engineering value network?
2) What are the globalization response strategies, particularly of system suppliers and subcontractors?

The objective of the first question is to broaden our understanding of the impact of globalization on the mechanical engineering industry. The literature review in Chapter

2 explores the globalization impact, resources and competitive advantage related issues in greater detail.

Based on the themes discussed in the literature review, a preliminary theoretical framework is constructed in Section 2.6. This framework will then be used as the foundation upon which to build the empirical study. In the final chapter, a revised model of effective supplier responses to globalization will be presented. This model links the theoretical and empirical perspectives to provide a revised understanding of how globalization can be turned into supplier advantage.

Finally, the objective of the second question is to find out how the suppliers are adapting their strategies in response to globalization. Since there are both effective and ineffective ways to respond to globalization, this study aims to highlight the most successful strategies. The question will be examined from both theoretical and empirical perspectives. The literature review in Chapter 2 will touch upon the foundations of response strategies: firm resources, capabilities and competitive advantages. Thereafter, the empirical study verifies the resources and competitive advantages presenting the resulting response strategies.

1.5 Research Approach

This section outlines the general research approach. The research methodology is introduced in more detail in Chapter 3.

The three target groups, which were defined in section 1.2, are the following:

1. Original equipment manufacturers (OEMs, top-level customers in the value chain)
2. System suppliers (first level suppliers in the value chain)
3. Subcontractors (second and third level suppliers in the value chain)

The scope of the questionnaire formation is twofold as a result of the dissimilar roles of the groups in the value network. First, the study is interested in the sourcing and

supplier relationship management of OEM's to see the impact on their subcontractors from this angle. Second, the study aims to investigate sales and customer relationships management of subcontractors and system suppliers to capture a different perspective. For these reasons, the three distinctive research groups, OEMs, system suppliers, and subcontractors, have been approached each with a different set of questions.

It is important to point out that right-to-the-point type of questions such as "How has globalization affected the operations of your firm?" have been avoided because of the complexity of globalization and its indirect impact on the smallest subcontractors in the value network. Based on the small sample of test respondents from the industry subcontractors it seemed that these managers did not always fully comprehend globalization nor they were able to identify its impacts. The better results were obtained by asking managers questions such as "What has changed in your operations as world markets have opened up and new technologies have emerged?" – or even "How is your business different now than ten years ago?". Naturally, some inferences have to be made in order to arrive to globalization impacts facing the mechanical engineering industry's value network as a whole.

In this study the empirical findings, the respondent comments in particular, have been used as openings for the theoretical theme presented in the literature review. The mechanical engineering industry expert quotes have been added to serve as real-life openings for the topics of each section, since they well paraphrase the theme. Moreover, they add a needed perspective of the Finnish mechanical engineering field.

1.6 Structure of the Thesis

This section describes the structure of the study, which is divided into five chapters. This introductory chapter has provided a background to the Finnish mechanical engineering industry, introduced the research questions, objectives, approach, and the two stakeholders behind the study.

Chapter 2 sets out to investigate the impact of globalization on the Finnish mechanical engineering industry value network, and the foundations for globalization response strategies: firm resources and competitive advantages. This investigation is done by means of a literature review. Also, a theoretical framework for the globalization impact is formed, which later forms the basis for conducting the empirical study.

Chapter 3 introduces the research design and methods used to carry out the empirical study. The choice of a quantitative research approach and more specifically, the survey strategy applied in this study, are explained. Then, the respondents and units of analysis are presented. Finally, the data collection and analysis methods are described and the validity and reliability of the study are discussed.

Chapter 4 presents the results of the empirical part of the study. First, the survey results are introduced in detail in section 4.1. These results represent the globalization impact on Finnish mechanical engineering companies. Second, results regarding the globalization response strategies are outlined as brought up by the respondents in section 4.2. The final section of the chapter provides a discussion on the response strategies to globalization. In addition, a model of the supplier response through value innovation process is presented.

Chapter 5 provides conclusions to the current research. The chapter is divided into five sections. First, the research and its purpose are summarized. Second, the main findings of the research are explicitly stated. Third, the managerial implications of the study and a model for supplier globalization response are presented. Finally, suggestions for further research are offered.

2. REVIEW OF GLOBALIZATION IMPACT ON MECHANICAL ENGINEERING

This chapter investigates the impact of globalization on the value network of the mechanical engineering industry and the foundations for globalization response strategies: resources and competitive advantages. The two research questions are inspected on the basis of earlier literature as well as industry expert opinions. The expert quotes from the empirical study have been added to serve as real-life openings for the topic of each section, since they well paraphrase the theme. Moreover, they add a needed perspective of the Finnish mechanical engineering field.

The purpose of this chapter is to find out what are the specific response strategies of mechanical engineering companies – particularly of suppliers to use to become tomorrow's success stories. Responding to globalization takes both strategic planning and practical action. Strategic planning and competitive responses are introduced in the latter part of this chapter. First, however, the section 2.1 examines globalization impact.

2.1 Globalization Impact

> *"The fundamentals in technology industries are totally changing as the global economy is opening up and new technologies are rapidly emerging. The challenge posed by globalization and the expansion of European Union is comprehensive."*
>
> - Eero Hovi, Head of Research of The Finnish Metalworkers' Union (Hovi, 2007, 5)

This section examines the globalization impact on the mechanical engineering industry. Globalization impact is examining based on the selected themes of the study – customer demands and competition.

It is commonly acknowledged that globalization has already left its mark on the Finnish mechanical engineering industry and will continue to do so in the future. Without a doubt, many subcontracting companies have benefited from increased

indirect exports as a result of their OEM customers having become more involved in international business. However, globalization does not necessarily mean growth for the industry. On the contrary, many of the larger firms and subcontractors actually expect the industry to employ less people in the future (Laitinen, 2007b, B6).

The following sections take a closer look at some of the side effects of globalization as they appear to the industry suppliers. Quotations from industry experts, OEM buyers, and their suppliers are used to provide an important insider angle into the subject matter. First, rising customer needs and expectations are reviewed. Second, competition, a factor that increases hand-in-hand with the globalization phenomenon, is investigated.

2.1.1 Customer Demands

> *"We have recently bought components for our prototype and it required calling some 80 – 90 mechanical engineering companies. About 30 % of the components have been faulty. The industry is already badly overheated and anyone can come to the market and sell 'shit'. I predict that the mechanical engineering industry will enjoy an excellent ride for some time, but namely as a result of quality defects a total collapse will follow. The present quality is simply not good enough to be successfully sold to far service distances. The companies whose quality is good and who have long contracts with their customers will be successful. Such suppliers are roughly 50 – 60 % of workshops."*
>
> - Technology Manager of a company producing power plants (survey)

This section describes how the rise of globalization results in rising customer demands that suppliers must deal with. Whereas customers have always demanded value for their money, with globalization, there has come an abundance of suppliers, both low-cost and high in quality that buyers can choose from. In the case of dissatisfaction, the customer is not necessarily going to give the supplier another chance. Therefore, suppliers are forced to cope with the ever-rising customer demands on quality, price, and delivery time, as well as newly emerged demands such as environmental friendliness and after-sale services.

Helm, Rolfes and Günter (2006) showed that in the field of mechanical engineering, suppliers would seem to depend more on their customers than the customers depend on them. As a result of this loyalty, suppliers may keep on serving customers that are causing them losses in the long run. Therefore, in the majority of cases, termination of a customer relationship is a task for a customer to do (Ibid, 2006). In that regard, it would be interesting to see what customers value in supplier relationships. In this section, the expectations of customers are examined – the factors they presently value in a relationship with their supplier.

Riku Kuikka (2007), Sales Manager of contract manufacturing in Mantsinen Group, held a presentation in Kitee about the expectations that the contracting companies have for their suppliers. According to him and the many colleagues he was also referring to, these customer demands toward suppliers have constantly risen as a result of globalization.

The following five factors (Kuikka, 2007) represent the most important expectations that the industrial buyers have for their suppliers:

1. Ability to begin long-term relationships and contract manufacturing, which involves commitment in increased productivity, profitability, and product development
2. Ability to cooperate intensively, independently carry out large component assembly and component purchases
3. Internationalization – production presence and component sourcing in low-cost countries
4. High standards in quality, delivery accuracy, environmental- and work safety issues
5. Capabilities to operate with electronic commerce, extranet systems, and direct access to customers' information and operations control systems

To sum up the rising customer demands as one of the globalization impacts on mechanical engineering, the assumption can be made that Kuikka (2007) was mainly referring to partnership level cooperation between the OEM customer and its system supplier partner. This is because it might not be possible for a smaller component

subcontractor to have direct access to any customer's information system and carry out large assemblies if those are not its core businesses.

Nevertheless, if ever-strengthening partnerships truly are the aim of OEMs and the contemporary trend in sourcing, we can expect to see more system suppliers rise and grow. In the process, they are going to take over smaller subcontractors as well as the sourcing duties of their OEM customers. One can question the logic behind this by asking how the system suppliers can be more cost-efficient in this than their customers. In other words, would for instance IKEA be even more successful if it gave away its global sourcing operations to one of its suppliers?

This section has examined rising customer demands. In the next section, increasing competition is introduced as a globalization impact factor on Finnish mechanical engineering value chain.

2.1.2 Competition

"International competition brings along a need to improve competitiveness, but on the other hand it enables companies to grow"

- Material Manager of a company supplying component systems and integrated products for industries (survey)

This section introduces increasing competion as perhaps the most visible globalization impact factor on mechanical engineering suppliers.

As world markets continue to open and new technologies emerge, it is obvious that the playground gets bigger as more and more players join the game. The new players coming in increasingly represent foreign companies (Gomory & Baumol, 2004, 426). Thus, the competition can be said to internationalize. Moreover, the technological development and competition are strongly linked to one another (Ibid, 426). As one increases, so does the other. Globalization increases world trade, which increases competition. Competition at large enforces the expansion of improvement in technology.

The rules of the game are no longer the same as before. Companies who can adapt their operations accordingly will be able to benefit largely from globalization (Gabrielsson et al., 2005). In the mechanical engineering industry, suppliers need to improve their competitiveness in relation to others – also foreign – or otherwise they risk losing business. However, improved competitiveness brings along new potential customers and provides companies opportunities to grow, despite the increasing competition.

This section has investigated competition as a globalization impact factor. Competition and its counterpart technological change drive the companies to change their strategies and fill the gaps in their resources and capabilities. The next section continues with the resources.

2.2 Resources

This section examines resources, the foundation of a firm's competitive advantage and response strategies. First, a company's own resources – namely management and knowhow – are outlined. Second, external resources – partnerships and networks, and customer relationship profitability – are depicted.

The scope is mostly centered on the mechanical engineering industry in Finland, but section 2.2.4 also introduces industry findings from Germany. The lack of respective data from Finland is the reason for examining the German mechanical engineering industry.

2.2.1 Management Importance

"Only companies with competitive managers will be successful in the future."

- Purchasing Manager of a company producing variable speed AC drives (survey)

This section presents the importance of qualified management as a response strategy to globalization. There have always been managers – both good and bad – in the business world, mechanical engineering included. However, now more than ever

before good managers can make a difference in their companies with the emergence of globalization challenges and opportunities.

Changing the organization, particularly toward globalization, can take a great deal of time, and management efforts, even for the biggest multinationals (Yip, 1994, 551). Overall, leadership challenges are increasingly emerging today and will continue to do so in the future in both upper and middle management levels (Koskinen, 2006, 29).

One of the management problems in mechanical engineering is illustrated with the example of the buyer constantly buying from the neighborhood supplier. In the example, the supplier thinks that every need of this specific customer is his business. On the other hand, the purchaser thinks that this supplier is perfect for him as the supplier can fulfill all his needs – with a delivery time and price determined by the purchaser. Qualified managers are needed for both supplying and buying organization to break this ever so common illusion. Globalization guarantees that alternatives – both suppliers and customers – are available. The role of the management is to make sure that these alternatives are investigated and, if beneficial, taken advantage of.

Even when talking about business-to-business transactions, people and their personal interests are still heavily involved. Without a doubt, most purchasers and sourcing managers do not question the validity of asking proposals in regard to interest of the company. However, their own personal interest is often contradictory to that of the company. They just want to get the job done as easily as possible without increasing their own workload. It is tempting for buyers to choose the easy way out and continue with the existing suppliers. The supervisors and top management should ensure that sourcing does not fall into this inefficiency trap.

Globalization has forced companies to seek cost-efficiency in operations to stay competitive. Therefore it is of vital importance that the top management of Finnish multinationals pay enough attention to sourcing. It appears that overspending in component purchasing during this ongoing boom-period is a widely spread trend (Siiskonen, 2007). Unfortunately, it has a drastic effect on the overall profitability of the firm.

It is the task of top management to oversee sourcing and the performance of individual purchasers. If too much slack is given to purchasers, they stay in their comfort zone and avoid the process of seeking new subcontractors continuosly. Top managers should keep in mind that generally savings in component purchases carry automatically to the bottom line. Achieving a similar benefit by increasing the sales volume often requires significantly more effort and increased resources, which in turn builds up the costs.

Likewise, in system suppliers and subcontractors top management has to keep an eye on the cost-efficiency of production. Sales people are keen on selling and production people are devoted on production. The management should work as a link in between the sales and production to ensure that what is being sold is also produced at profit without compromising quality and delivery accuracy of other orders.

This section has highlighted the importance of management in avoiding the common pitfalls in responding to globalization. The next section explains how knowhow management can be used for the same purpose.

2.2.2 Knowhow Management

> *"Suppliers must develop and enhance their knowhow and products. Suppliers are the ones who have to have the knowhow and outsource manufacturing work from others that are competitive in it."*
>
> - Development Manager of a company producing hydraulic systems (survey)

This section describes knowhow management, which involves creating and transfering knowledge, as a response strategy to globalization.

Successful companies are social communities that excel in the creation and internal transfer of knowledge (Kogut & Zander, 2003, 516). Knowhow management is mostly about leading people, not managing things, but an essential part of it is also about taking care and developing processes and operations (Koskinen, 2006, 58).

Most probably knowhow is an important foundation of a successful company. With globalization pressure, the management of knowhow and knowledge transfer within a company separates the successful from the unsuccessful. Successful companies grow and capitalize on the opportunities of globalization. Company growth is fueled by superior ability to create new knowledge and to replicate this knowledge within the firm (Kogut & Zander, 2003, 525).

All companies, no matter how advanced they are in knowhow management, can learn even better ways of working from other companies and develop their knowhow (Koskinen 2006, 17).

Koskinen (2006) has identified practical tools for the use of small and medium sized enterprises in knowhow management. His research touches upon management issues that are important also for the companies operating in the field of mechanical engineering in Finland. He divides the management challenges into five categories:

1. *Competence related challenges*

   As "baby-boomer" generations are aging and entering retirement, a massive amount of vital knowhow and tacit knowledge is leaving from the companies. This is especially true for mechanical engineering suppliers. With knowhow management practices these suppliers must facilitate the transfer of knowledge from old generations to new ones through documentation, capability sharing and enrichment for the benefit of personnel and organization as a whole (Koskinen, 2006, 26).

2. *Strategy and leadership related challenges*

   Strategy and leadership related challenges are in question when company confronts a situation that requires immediate action and significant changes in the present business strategy (Ibid, 27). In mechanical engineering, for instance a company may have produced bulk-products in high volumes but as a result of increased competition it is no longer profitable business.

3. *"Soft issues" related challenges*

   Koskinen (2006) calls soft issues for instance attitudes to work, motivation, social skills and work well-being related challenges. These challenges may emerge in companies under turbulance or constant work related stress. It appears that in mechanical engineering the "soft issues" are among the

toughest challenges, and taking care of them successfully requires great efforts, leadership, knowhow development and commitments (Ibid, 31)

4. *Financial, market and industry related challenges*

In mechanical engineering internationalization related challenges fall in to this category. Globalization poses a challenge to industry suppliers as they must choose whether to genuinely internationalize their operations closer to the markets where their customers – and in most cases also competititors are (Ibid, 32). Internationalization of operations is likely to require new type of knowhow management from suppliers.

5. *Technology related challenges*

New competencies and knowhow is needed when new technologies are taken into use. Presumably mechanical engineering companies make no exception.

To cope with all these challenges companies can either a) develop their own knowhow, b) buy knowhow, c) borrow knowhow, or d) bind existing knowhow to the company, with for instance key personnel incentive programs (Koskinen, 2006, 73).

This section has explained the importance of effective knowhow management as a response strategy to globalization. Sometimes its own knowhow is not enough for a company, thus it must rely on the knowhow of partner companies. The next sextion touches upon this issue.

2.2.3 Partnerships and Networks

"Business networks are going to grow in importance. There will be small and really big manufacturing units. In between the two extremes companies find it difficult to operate. Therefore the number of medium sized companies will go down. The small companies have a narrow niche in which they can specialize in."

- Managing Director of a subcontracting company specialized in lasercutting and sheet metal forming (survey)

This section presents partnerships and business networks as a response strategy to globalization. When mechanical engineering companies move away from traditional

strategies and specialize in their core competenceies, the external networks of partners become increasingly important.

As a result of globalization firms are increasingly embedded in networks of other organizations, including both cooperative and competitive relations (Ritter & Gemünden, 2003; Ford, Gadde, Håkansson, Lundgren, Snehota, Turnbull & Wilson, 1998). These days the global markets favor specialization and effective networks of firms possessing different knowhow (Koskinen, 2006, 17).

Möller, Rajala & Svahn (2004) have focused their research on networking trend. The authors claim that the more companies specialize, the greater are the interdependencies and linkages between companies, as they must rely on the core competencies of one another (Möller et al., 2004, 18 – 19). These bonds and linkages are becoming increasingly complex and interactive. In other words, business networks are being formed. Increased dependency to the competencies of others creates a significant risk for the companies who do not possess alternative suppliers or customers. Outsourcing value chain activities brings efficiency, but also creates dependency (Ibid, 18).

Partnerships in Mechanical Engineering

Perhaps the most common form of business networks in mechanical engineering are partnerships between two or more companies. In this context, partnerships have been thoroughly studied by Vesalainen (2004). His objective was to find what is actually meant by "partnerships" in mechanical engineering; what elements they constitute of, and what kind of forms they take in practice.

In his research, Vesalainen (2004) defines the different forms of organized exchange as follows: 1) spot market, 2) contractual, 3) virtual, and 4) partnership. A *Spot market* is the simplest form of price mechanism possessing organizations. This is because the existence of mutual trust between the parties is not needed, as the parties remain distant. Next, a *contractual* organized setting differs from a spot market as there is trust based on mutual contract in place between the parties in transaction. The foundation of contractual setting is laid on solid interpersonal relationships. Then, closest to a hierarchical organization comes a *virtual* organization. In this setting,

price mechanisms are challenged by the complexity of the relationship, which results in difficulties in determining the market price for exchange. This is the case when the business relationship includes complex outputs, various service functions and future oriented research & development. As a result of complex relationship joint structures, systems, and even integration of core processes start to take place between the companies. (Vesalainen, 2004, 34 – 35)

Finally, Vesalainen (2004) suggests that when all the control mechanisms spot market, contractual and virtual come together, a partnership is formed. A partnership is very much like virtual organization but with a stronger feeling of solidarity. The essential difference is shared win-win mindset; there are no conflicts of interest between the partners, prevailing norms and culture are unified, and trust is in place.

However, a partnership is not without challenges as the elements, organizational setting, price mechanicsm, structures, systems, trust and joint goals, are brought together in forming it. The problem is that the elements tend to clash into one another and often compromises have to be made. As a result of the exchange being so complex, the market price for the entity is difficult, if not impossible to determine. Therefore, the price mechanism of exchange cannot be fulfilled in the markets. This, of course, means that the buying partner can never be completely assured whether the supplier is the best choice when all factors are considered.

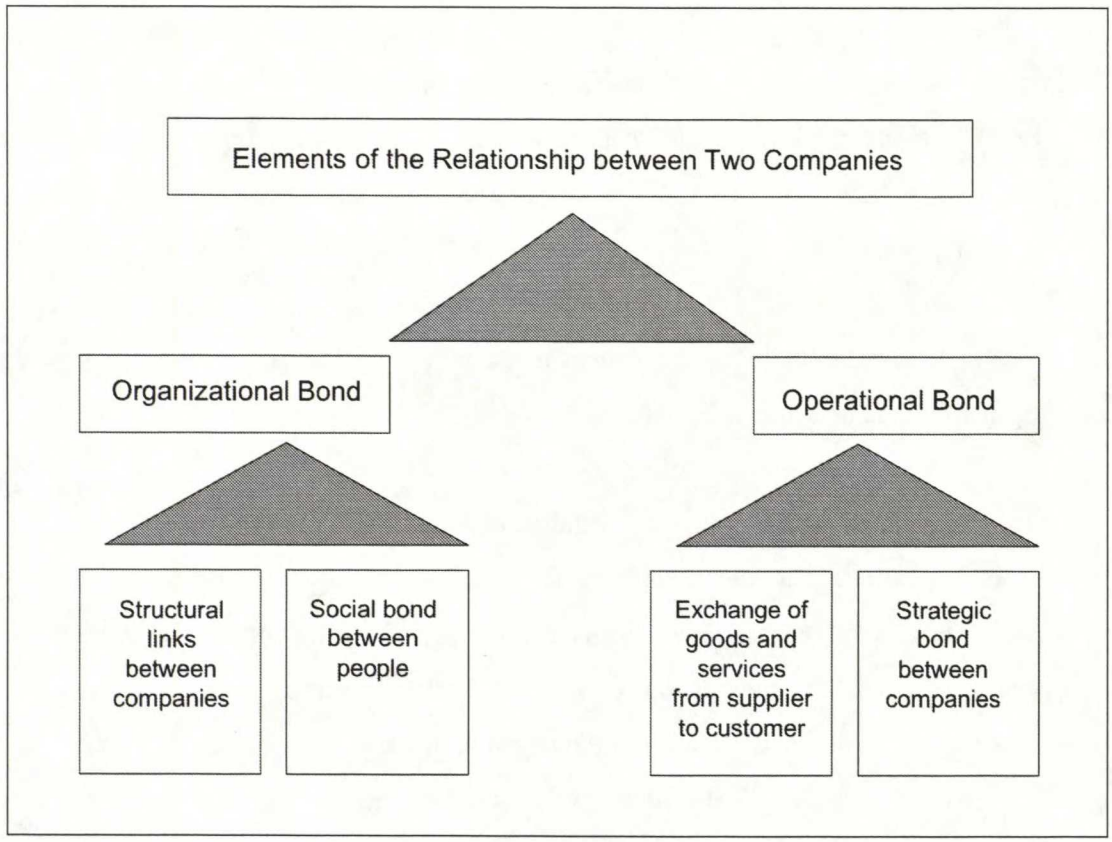

Figure 4 Framework for Partnership Analysis (Vesalainen, 2006, 48)

In the book *Kaupankäynnistä kumppanuuteen* Vesalainen (2006, 48 - 65) portrayes the partnership between two companies as a product of several elements, illustrated in Figure 4 above. Structural links between companies include surface structures, common and integrated systems, and common and integrated processes. Surface structures stand for working routines and practices that have emerged between companies and taken a form of structural elements. Practical examples of these include for instance development teams, subcontractor days or basically any functions where personnel of the two companies are in constant interaction with one another. Another element of structural linkage concerns different systems that companies have in place. The more companies have developed and harmonized their information systems, measurement systems, production systems, etc., the stronger is the structural link between them.

Organizational operations and relations between the companies are largely a visible result of existence of interpersonal relationship networks – social bonds between people. In a nutshell, organizations are merely social structures where people

coordinately function guided by the structures, systems, strategies and objectives. It is crucial for the performance of organizations to have people commit, motivate and behave themselves accordingly under the structures. The keyword here is trust. Trust itself is actually one of the most widely researched and approved concepts of relationship marketing (e.g. Dwyer, Schurr & Oh, 1987; Ganesan, 1994; Mohr & Spekman, 1994; Izquierdo & Cillán, 2004). There are numerous definitions of trust but most include a belief that the partners in exchange will act in the best interest of one another (Ulaga & Eggert, 2006).

The more developed trust is between organizations and people, the more intertwined are the organizations and the better are the chances for further improving the co-operation. Trust enables parties to find ways to work out difficulties together. Also, the greater knowledge transfer there is as a result of close interaction between organizations and people, the more connected the parties are to one another. This way mutual learning is allowed to take place for the benefit of both co-operative organizations.

In regard to exchange of goods and services from supplier to customer, Vesalainen (2006, 56) points out the two viewpoints as follows. First, physical exchange can be seen as a fraction, small or significant, of original equipment manufactured by the customer. Second, one can observe the various other service functions the supplier may perform on behalf of its customer. Naturally, there exists significant variation in the size of physical exchange. Generally we can talk about component manufacturing, system manufacturing and original equipment manufacturing (OEM) in the field of mechanical engineering. System manufacturing includes assembly of components where as OEM-manufacturing stands for a company manufacturing its own original equipment.

A strategic bond between companies is formed not only through goods and services exchange, but through other factors as well. First, as companies are specialized in their operations their core competencies complement each other, creating a strategic dependency. Second, the same strategic dependency can come through common visions and strategic goals set in partnership. Third, the resources put forward to achieve the goals of partnership strengthen the strategic bond. A company that invests

most of its resources in developing its operations in regard to one specific partnership, and so that the benefit realizes in profits only over a longer time period is strategically bound to the partnership. A joint effort in development operations is the case of a joint venture. However, in mechanical engineering it is less common than usual that the subcontractor invest in new machines and develop its know-how to be more competitive than the other suppliers. (Vesalainen, 2006, 59)

This section has examined the formation of business networks from a theoretical perspective, and in particular partnerships in mechanical engineering. These partnerships and networks are often, at least in the early stages of their development, formed locally with strong bonds in between the parties (Möller et al., 2006, 224). Globalization enables – and often pushes – companies to form networks with also international partners to ensure productivity and profitability. The importance of profitability of customer relationships is investigated in the following section.

2.2.4 Customer Profitability

> *"We cannot preach customer orientation and at the same time eliminate customers merely because of low contribution margins"*
> - Manager in a German mechanical engineering company (Helm, Rolfes & Günter, 2006, 378)

This section presents the increased importance of customer profitability to mechanical engineering companies. Globalization has driven firms to a point where they must choose between flexible customer orientation and getting just the right customers.

Despite the favorable demand in the market and growing sales, companies have a hard time in making a profit (Kauppinen & Kinnunen, 2007, B1). Together with increased competition, a reason for this may be the old-fashioned thinking of satisfying the varying needs of current customers rather than choosing to satisfy the specific, similar needs of other potential customers for a better profit. Therefore, managers find trying to be both customer and profit oriented difficult (Helm, Rolfes & Günter, 2006). Being profit oriented requires critical evaluation of the customer base and choosing the right customers. Finding the right balance in between customer and profit

orientation becomes extremely difficult if mechanical engineering suppliers do not possess tools to evaluate customer profitability (Ibid, 2006).

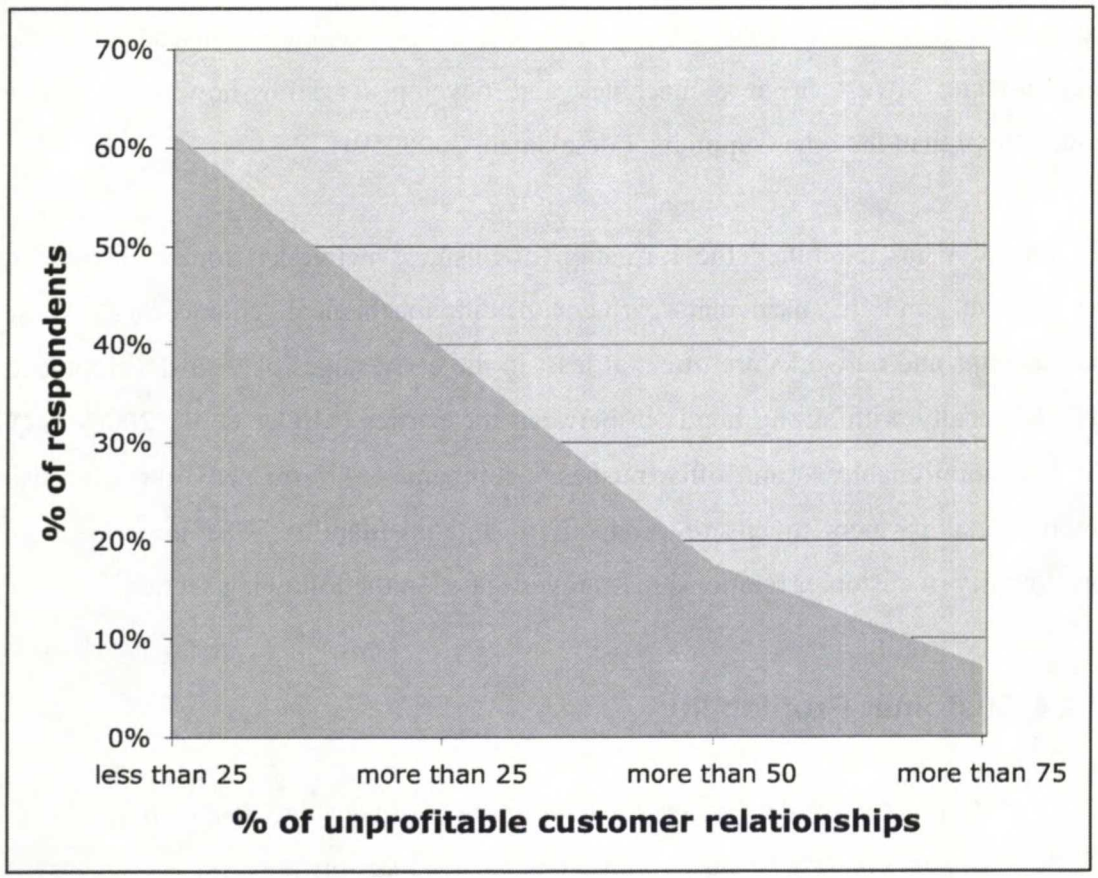

Figure 5 Percentage of Unprofitable Customers in all Customer Relationships in German Mechanical Engineering (Helm, Rolfes & Günter, 2006, 374)

Customer relationship profitability in mechanical engineering has not been studied in Finland. Therefore the German respective data is examined. Figure 5 above shows that in German mechanical engineering, many of the customer relationships are not profitable. Overall, 184 respondents representing mostly CEO's, vice presidents, and general managers of small and medium-sized German mechanical engineering firms completed the survey. About one fifth of the German respondents claim that over 50 % of their customer relationships are unprofitable for them. The same study also shows that many companies in the industry lack the knowledge and use of customer valuation techniques (Helm, Rolfes & Günter 2006, 366). The results of their study lend support to the common assumption that the operational inefficiencies exist as a result of suppliers not ending unprofitable customer relationships. Why do the suppliers not terminate the customer relationships causing losses?

Firms generally strive for profitable relationships in order to gain overall profitability. Customer profitability weighs sales or revenues associated with individual customers to the respective costs as a measure for relationship value (Zolkiewski & Turnbull, 2002). In short, when real or anticipated costs outweigh the benefits of relational exchange, relationship dissolution should become an issue from an economic point of view.

Three frameworks for supplier-initiated relationship dissolution include 1) social exchange theory (SET), 2) resource-oriented theories (ROT) and 3) transaction cost approaches (TCA). First, social exchange theory has its roots in the social psychology of human relationships. In short, SET recommends relationship break-up as a rational solution when the expected outcomes are not the best available and therefore do not maximize satisfaction (Zolkiewski & Turnbull, 2002).

Second, resource-oriented theories view the value of a customer relationship as a product of all benefits provided by a customer. Therefore, ROT recommends keeping only those customers who provide long-term value without calling for investments that could be applied more efficiently elsewhere (Vesalainen, 2004, 23).

Third, the transaction cost approach proposes that firms enter into relationships to cut down the costs associated with keeping up a series of discrete transactions. In regard to ending a relationship to look for alternatives, TCA suggests the supplier to break up those customer relationships where transaction costs are higher than the establishment of the alternative options. (Helm et al., 2006)

Generally, relationship terminology considers maintaining and enhancing customer relationships important. These considerations are well put into practice, as companies also in the mechanical engineering field, seek to hold on to their customers. Unfortunately though, many managers overlook the importance of terminating customer relationships to free production capacity and resources for more profitable business opportunities (Siiskonen, 2007). The mechanical engineering suppliers need a new view of relationship marketing to put into practice.

When breaking up a customer relationship becomes an issue, firms can rely on the new view of relationship marketing. Grönroos (1994) has defined it as follows: "Relationship marketing is to identify and establish, maintain and enhance and when necessary also to terminate relationships with customers and other stakeholders, at a profit, so that the objectives of all parties are met, and that this is done by mutual exchange and fulfilment of promises." (Grönroos 1994, 9)

In the study by Helm, Rolfes & Günter (2006), most German respondents were in the opinion that unprofitable relationships are common in the industry. It seems that suppliers have a hard time valuing their customers and giving up on them, no matter how unprofitable they may be in the long run. This supplier loyalty toward their unprofitable customer relationships may well be one of the key cause for low profit margins in the industry. There is a need for customer evaluation and more thorough understanding of the drivers that determine a firm's willingness to end customer relationships in the field of mechanical engineering.

Globalization brings along new opportunities, and potential new clients, for mechanical engineering suppliers. Nevertheless, suppliers can fully take advantage of these if they know the profitability of ther customers and use their resources where they are at most profitable use. Resources and capabilities are used to answer customer needs and demands, ideally in a way that builds competitive advantage for the supplier. The next section delves into competitive advantage.

2.3 Competitive Advantage

> *"Those companies that develop their operations will survive and benefit from increased trade and those who think they've already got what it takes will lose."*
>
> - Sourcing Engineer in a company providing solutions globally in materials technology (survey)

This section reviews the competitive advantages out of which the response strategies to globalization are stemming from. The objective of the strategies is to provide

means for Finnish mechanical engineering companies to stay competitive and respond to the impacts of globalization.

Globalization pressure affects the own and external resources of a firm, which in turn form the capabilities of the firm. The capabilities are a basis for the firm's competitive advantage upon which the response strategy is built. With the response strategy the firms identify and fill their resource and capability gaps. (Gabrielsson et al., 2005, 12)

A response strategy is largely a result of innovation, taking various forms, but ultimately used as a competitive weapon to gain ground over rivals (Gomory et al. 2004, 428). Here, it is vital to meaningfully differentiate the firm's market offering from directly competing market offerings in the minds of prospective customers (Anderson & Narus, 1998).

The following sections describe the competitive advantages reviewed in the current study. First, increase of overall operational efficiency is presented as a possible source for competitiviness and ultimately a basis for a response strategy. Second, internationalization of operations is investigated as a possible way for a mechanical engineering supplier to differentiate one's offering from the competition and build competitive advantage. Third, the advantages of specialization in countering globalization challenges are examined. Quotes of industry experts, OEM buyers and their suppliers are used as topic openings, as they provide an important insider angle into the subject matter.

2.3.1 Efficiency of Operations

> *"One must seriously think of the competitiveness of the firm in the future. In today's sourcing boom many suppliers have prized themselves so that they are incompetitive. Cut-throat play-offs start when there is a downturn in the economy."*
>
> - Product Development Manager of a firm providing containers and material handling equipment (survey)

This section describes a strategy shift from operational inefficiency to efficiency. This issue is relevant to both sourcing organizations and suppliers alike. In this section, the inefficiencies in sourcing are analyzed first. Second, things that industry suppliers can do to be more efficient in his operations, especially in sales and marketing, are examined.

How should a supplier respond when he realizes that he is no longer competitive and loses business to his competititors – both known and continuously emerging? On the other hand, what should OEM management do when they notice that their products are no longer generating profits with purchases constituting over 80 % of turnover?

Instead of blaming its customers for not paying what is asked, the supplier could look into his operations and think how he could work more efficiently, thus lowering his costs. Likewise, the OEM management in this case should not employ additional resources in marketing efforts before looking into their sourcing operations and think about how they could save on their purchases, thus creating added value for their customers. A saved euro in purchase volume automatically carries over to the bottom line. As the industry average sourcing volume of a company is getting close to 70 % of its revenues (Hernesniemi, 2007, 24) it makes a lot of potential euros to be gained.

Unfortunately, the old ways of working are slow to change and prevailing inefficiency in operations still dominates. However, globalization is pushing mechanical engineering companies to investigate their competitiviness and improve their operational efficiency.

Inefficiencies in Sourcing

The industrial buyers' opportunity has – with a few exceptions – remained largely unexplored despite its importance (Wagner & Friedl, 2007, 701). In order to maximize profit, a buying firm should continuosly look for and access suppliers that offer more favorable prices (Wagner & Friedl, 2007; Siiskonen, 2007).

According to Managing Director of Tietoset Oy, Antti Siiskonen, who cooperates with about 3000 industrial buyers in his work, mechanical engineering industry sourcing purchases are made to a handful of suppliers and the importance of the entity

of price, quality, and delivery time is often neglected (Siiskonen, 2007). Buyers seem to have a tendency to interact and do business with people they are familiar with. The slothful supplier switching behavior is consistent with socio-psychological concepts, such as norm theory or decision avoidance (Wagner & Friedl, 2007, 711). In other words, great uncertainty avoidance exists in sourcing.

Siiskonen (2007) feels that too much emphasis is put on the long-term partnership thinking. The saying "the longer the partnership, the closer it is to end" is often forgotten. Sourcing inefficiency takes many forms, but for example there are cases where the proposal requests are not even sent to prospective suppliers before completing the purchase. In the long run, this means that OEMs end up paying too much for their components as the prices they pay increase over time. In the meantime, more cost-efficient production methods and machines have been developed, which are in suppliers use elsewhere. However, as the buyer has neglected to keep his/her eyes open, this cost-saving opportunity is often bypassed. (Ibid, 2007)

This sourcing inefficiency is likely to create an illusion for small-sized subcontractors. The suppliers feel that their position is secured as the same buyers constantly send in orders and fill up their production capacity. Therefore, the suppliers may avoid making investments in new technology and finding the most cost effective solution on behalf of their customer. The true problem here that affects both parties is that the selected supplier is in many cases not the best available for a given need.

The combination of machines, competencies, capacities, and overhead expenses in regard to the type of need, its volume, and desired delivery time determine the price. It should be the task of a buyer to find out whether the neighborhood supplier is the best, most cost-efficient sourcing choice for the company. If not, the buyer should look for the one who could be a better option (Wagner & Friedl, 2007; Siiskonen, 2007). The only way to find this out is to do what any purchaser should do, and that is to look for options through knowing the capable subcontractors and approaching them with requests for proposals. Nevertheless, very few purchasers seem to do this. However, globalization is pushing more and more purchasers out of their comfort zone to do what is best for the company.

Inefficiencies in Supplier Operations

After looking into the sourcing side of buying organizations, the second theme of this section is to investigate the sales, marketing and production related inefficiencies on supplier side. It is widely recognized that marketing is one of the most, if not the most, important business function in which Finnish companies need improvement. The mechanical engineering system suppliers and subcontractors are not an exception. Actually, they may have invested in marketing even less than Finnish companies on average, due to buyers initiative role in relationships, which are long and provide a relatively stable revenue stream for suppliers.

The widespread model of thinking among the suppliers in mechanical engineering seem to be that "when my customer calls, we fulfill his need, irrespectively of what it is." This is wrong though, however easy it may seem to work this way just waiting for the demand to come through the door. Although it may seem hard for any salesman to say no to a key customer, it should be done when the need cannot be satisfactorily answered. For instance, lack of a suitable machine, competencies or need for a production run rescheduling causing inefficient use of capacity are some of the reasons why choosing to answer the demand might in fact be unprofitable and unreasonable for the company. Many subcontractors choose to accept unfavorable terms in fear of losing a customer (Helm et al., 2006). By choosing this strategy, they unfortunately prioritize plain workload over profitable work.

The end result is that the supplier has to struggle with meeting the quality standards as well as delivery times for the incompatible production run. As one bottleneck in production appears it has an immediate delaying effect in all production, causing even more stress. In the meantime, the supplier may have to turn down some suitable business opportunities as their troubles escalate and all the resources are already in use to clear the problem. It is not much of hassle to eventually run a significant loss or at best zero profit on a project that seemed incompatible already at the first place. The supplier could have simply avoided this by focusing on projects that best meet his competencies and business strategy (Siiskonen, 2007). The incompatible product ought to be left to manufacture by someone else who is better equipped to handle the task.

Even under the impact of globalization, there is no doubt that someone always produces every component that needs to be manufactured. However, eventually the winners are those who successfully attract and locate as much suitable, hence profitable customers as possible. The losers are left with an everlasting struggle of satisfying the various needs of their current customers instead of locating and profitably satisfying the specific needs of various customers.

The same logic applies to sourcing, as introduced earlier. The winners are those who constantly seek for better, less expensive suppliers that best meet the need at hand (Wagner & Friedl, 2007; Siiskonen, 2007). The losers in sourcing are those not aware of various sourcing opportunities therefore left with only a handful of trustworthy, certified suppliers that work inefficiently, pushing delivery times and do not provide a cushion needed especially in the bad times.

In this section, globalization has been shown to push the companies to work more efficiently. Globalization is also pushing companies to internationalize their operations. The next section examines this topic.

2.3.2 Internationalization of Operations

> *"One must be actively involved in going to developing markets side by side with the customers. Equally important is to keep ones knowhow at a high level in products that are going to be manufactured in Finland and take advantage of foreign low costs manufacturing."*
>
> - Sourcing Engineer in a company providing solutions globally in materials technology (survey)

This section presents internationalization of operations as a means for a mechanical engineering suppliers to build competitive advantage in the markets and thus respond to globalization. In this section internationalization of small Dutch mechanical engineering companies is examined. This is done because internationalization of respective Finnish companies is largely unexplored in literature.

Mechanical engineering subcontractors have traditionally located their production facilities relatively close to their key customers for logistical reasons. As their customers, OEMs, now operate in a global marketplace, serve global customers, and face global competition, they are in turn both directly and indirectly internationalizing the operations of their subcontractors. In some cases, subcontractors must establish production facilities in foreign countries where their customers have assembly factories. It is evident that the scope of operations has shifted from local to international. However, the specific strategies suppliers follow to internationalize their businesses is less clear.

Gemser, Brand, and Sorge (2004) have researched the internationalization process and strategies of small businesses in Dutch mechanical engineering and computer software industry. The authors found out that irrespective of the industry, small firms tend to follow an evolutionary internationalization path with a majority preferring a cooperative internationalization strategy, which involves allying with partners in all levels of the value chain. Particularly in mechanical engineering, human and financial resource constraints direct companies to choose cooperative internationalization strategies and form strategic alliances. (Gemser, Brand & Sorge, 2004)

Gemser, Brand, and Sorge (2004) found that all surveyed mechanical engineering firms in the Netherlands started their internationalization process by first entering relatively close markets within the European Union and later expanded further into far away foreign markets (Ibid, 2004, 139). It seems clear that cultural and economic distance plays a significant role in market selection process. However, the research showed that other important factors include following a client, perceived market growth, and market potential. These findings are in line with the experiences of many Finnish mechanical engineering firms, which have chosen to internationalize in cooperation with their key customers.

Gemser, Brand, and Sorge (2004) found that common entry modes to foreign markets are direct exporting, strategic alliances and subsidiaries. However, firms change their entry modes. Some regress from using high-risk, high commitment mode to low-risk, low commitment mode of entry and vice versa. Reasons for entry mode "upgrade" included economic and managerial learning. In other words, market potential or size

proved more risky modes applicable and managers learned to be more confident as they got to know the market and establish a trusting partnership with a local firm. Reasons for choosing less risky modes of entry were generally due to ineffective, ill-executed modes of entry often combined with human and financial resources constraints. (Ibid, 142 – 143)

It is commonly argued that supportive linkages may be a driving force and an important facilitator in the internationalization process. Luostarinen and Gabrielsson (2004, 14 – 24) show how vital these supportive linkages are for a globalizing SMEs in tackling managerial, research & development, sales and marketing and financial challenges. These linkages come in the following forms:

1. Solutions to managerial challenges:
    - International advisory board
    - Business mentors, technological godfathers, entrepreneurial counselors etc.
    - International business consultants and marketing services
    - Value chain building by creating partnerships, forming alliances, and constructing networks

2. Solutions to research & development challenges:
    - Joint R&D financing with potential customers and R&D financial agencies
    - Networking and partnerships in research and development with domestic and global firms and institutions

3. Solutions to sales and marketing challenges:
    - Early contact with customers and sales/distribution channels
    - Utilization of multiple marketing channels
    - Formation of marketing partnerships and strategic alliances

4. Solutions to financial challenges:
    - Involving venture capital firms and business angels to fuel the growth

(Luostarinen & Gabrielsson 2004, 14 – 24).

The findings of Gemser, Brand and Sorge (2004) support the findings of Luostarinen & Gabrielsson (2004). They argue that particularly regional and national institutions promote internationalization of SMEs by providing funding and valuable information to the companies (Gemser et al., 2004, 143).

Furthermore, many Dutch firms choose to rely heavily on the network of large clients and suppliers, both international and domestic, which are able to provide them a gateway to international markets. Equally important with the network of clients and suppliers in finding suitable partners seem to also be the personal networks of the owners or managing directors. Not only do the networks described above facilitate the internationalization process, but so does the "history" of the firm. The past of a firm be it privatization, a split up into separate parts, or even a bankruptcy of a predecessor company, all have a positive, aiding influence on the internationalization process. (Ibid, 2004)

This section has investigated internationalization of small and medium enterprises, mechanical engineering firms in particular. Internationalization and expansion to new markets is a natural continuation of specialization, which is introduced in the next section.

2.3.3 Specialization

> *"Suppliers need to specialize in an area which they know to be the strength of a company, and then invest fully in it."*
>
> - Managing Director of a subcontracting company specialized in sheet metal forming (survey)

This section introduces specialization, focusing on a company's core competence, as a means to build competitive advantage and thus respond to globalization. To effectively use specialization as a globalization response strategy, core competencies must first be identified and then capitalized on to become the best.

Presently, organizations are pushed to change their operations: develop new products and services, form networks and build partnerships, find new ways to generate

revenue and to develop existing business to new directions. This development has been put forward by liberalization of trade, globalization and rapid development of technology, information technology in particular. The companies can specialize in very different roles and functions, leaving tasks out of their core competence to be done by the other members of their business network. (Pulkkinen, Rajahonka, Siuruainen, Tinnilä & Wendelin, 2005)

Many of the smaller mechanical engineering suppliers have limited resources and therefore often their choice has been to identify a key business area, invest resources in it and thus successfully serve customers. In today's increasingly global and competitive business environment, specialization is often a wise choice of strategy. It is easier for a small company to be good and reliable partner in a certain niche rather than trying to become a wonder house for all the sourcing needs of a customer.

Specialization in core competence is associated with formation of networks and partnerships. Highly specialized suppliers need to be part of a network of other specialized suppliers to gain competitive power. Likewise, highly competitive supplier networks are based on the specialized competencies of the suppliers in the network.

In forming a specialization strategy, managers must consider that the core competencies fullfill the criteria of being 1) valuable, 2) rare, 3) inimitable and 4) non-tradable. If so, then the supplier can in fact build a strong competitive position in the business network. (Eisenhardt & Martin, 2000; Möller & Svahn, 2003)

This section has presented core competence specialization as a means for the suppliers, the small subcontractors in particular, to achieve their competitive edge and successfully respond to globalization.

2.4 Theoretical Framework

This section synthesizes the main concepts discussed in this chapter into a theoretical framework for globalization impact on mechanical engineering value network and the response strategies of industry suppliers. The theoretical framework conceptualizes the elements already discussed, and brings in a new dimension on how the resource and capability gaps are filled.

One of the strengths of the present study is that it builds on previous research on SMOPEC companies and business networks conducted by Finnish researchers, which increases its applicability to Finnish mechanical engineering context. The study continues the traditions of several key researchers or research teams. First, the study is based on the model of globalization impact on SMOPEC firms and their response strategies introduced by Gabrielsson et al. (2005). They establish that in the process of best exploiting the firm's resources and capabilities relative to external opportunities companies identify and resource gaps that need to be filled to successfully implement response strategies (Gabrielsson et al., 2005, 11 – 12). Their model is adapted to include a second dimension for the resource gap identification and filling. Second, this research builds on Vesalainen's extensive work (2004, 2006) on partnerships in Finnish mechanical engineering. Third, this study aims to add more mechanical engineering perspective to the work of Möller, Rajala and Svahn on business networks and their increasing importance in contemporary business.

The theoretical framework for globalization impact on mechanical engineering value network, depicted in Figure 6 at the end of this section, brings together globalization impact and the need for the companies to identify their resource and capability gaps, and fill them with corrective action (Gabrielsson et al., 2005). The purpose is to find out what are the more specific response strategies that can be used to fill in the gap between strategic plans and practical action.

Globalization works as a driving force – pushing companies to forget the past and realize the changing demands of the marketplace. The market place in mechanical engineering is changing. To illustrate this ongoing change the themes discussed in the literature review: globalization impact factors, resources items and competitive

advantages are set up in pairs, with the left representing the *past* and the right representing the *future* of the industry. The present therefore falls somewhere in between the two opposites.

The setup aims to illustrate that as the business environment is changing, companies must adapt their operations accordingly in order to respond and be successful in the future. If they do not adapt their operations accordingly, they will remain in the past, still struggling with operational inefficiencies and unprofitable customer relationships. The competition is there to make sure that the "companies of the past" later vanish from the markets.

Globalization impact reviewed in Section 2.1

Low vs. higher customer demands (Kuikka, 2007; Helm, Rolfes and Günter, 2006)

The demands of industrial buyers in terms of price, quality and delivery accuracy are constantly rising. Also new demands such as environmental friendliness and after sales services are on the rise. Good is no longer enough – often the supplier must be the best available.

Low vs. higher competition (Gomory & Baumol, 2004; Gabrielsson et al., 2005)

Competition increases side by side and at the same pace with technological innovations and globalization. This development is irreversible so companies have no option but to adapt their operations to be well positioned enough to cope with the competition.

Resources reviewed in Section 2.2

Low vs. higher management importance (Koskinen, 2006; Yip, 1994)

In the old days, a person with the right attitude to work and entrepreneurship was able to build a successful company from scratch. Today, it takes more than just a determined state of mind to build a company that successfully competes in an increasingly global market place of mechanical engineering.

Low vs. higher knowhow management importance (Kogut & Zander, 2003; Koskinen, 2006)

Knowhow management is a newly emerged function that separates the good from not so good companies. Through effective knowhow management companies can build a competitive advantage. An example of knowhow management is knowledge transfer from experienced, retiring workers to young employees.

Companies as "lonely wolves" vs. business networks (Ritter & Gemünden, 2003; Vesalainen, 2004, 2006; Möller et al., 2004)

Many traditional mechanical engineering companies were diversified in their operations and responsible for the entire manufacturing process, from component machining to final assembly, on their own. These days companies are specialized, for instance in assembly only, while outsourcing most of the required components from other firms within their business network.

Unprofitable vs. profitable customer relationships (Helm, Rolfes & Günter, 2006; Zolkiewski & Turnbull, 2002; Vesalainen, 2004)

One of the traditional characteristics of the mechanical engineering industry is strong customer loyalty and low turnover rate of customers. Yet many of the customer relationships have in fact been unprofitable for the suppliers and not cost efficient for the buyers. The rise of customer valuation techniques, effective purchasing and globalization pressure are slowly changing this, turning the unprofitable customer relationships into profitable ones.

Competitive advantages reviewed in Section 2.3

Inefficiency vs. higher efficiency in operations (Wagner & Friedl, 2007; Siiskonen, 2007)

As a consequence of ill-fit customer and supplier base alike the industry has operated inefficiently. The inefficiencies exist in both the sourcing operations of buyers and the sales & marketing of subcontractors. The rapid emergence of new production technologies and ever-tightening competition force companies to improve their operational efficiency.

Local vs. international operations (Gemser, Brand & Sorge, 2004; Luostarinen & Gabrielsson, 2004)

Generally subcontracting companies in mechanical engineering have been set up close to their customers for logistical reasons. Information technology, lower transport costs as well as globalization in general now make it possible for companies to engage in international operations for growth.

Generic operations vs. specialization (Pulkkinen, Rajahonka, Siuruainen, Tinnilä & Wendelin, 2005; Eisenhardt & Martin, 2000; Möller & Svahn, 2003)

Earlier it was common for a mechanical engineering firm to be a wonder house for everything. Nowadays, companies increasingly have highly specialized manufacturing units and often outsource most of the production to even other companies with special expertise required.

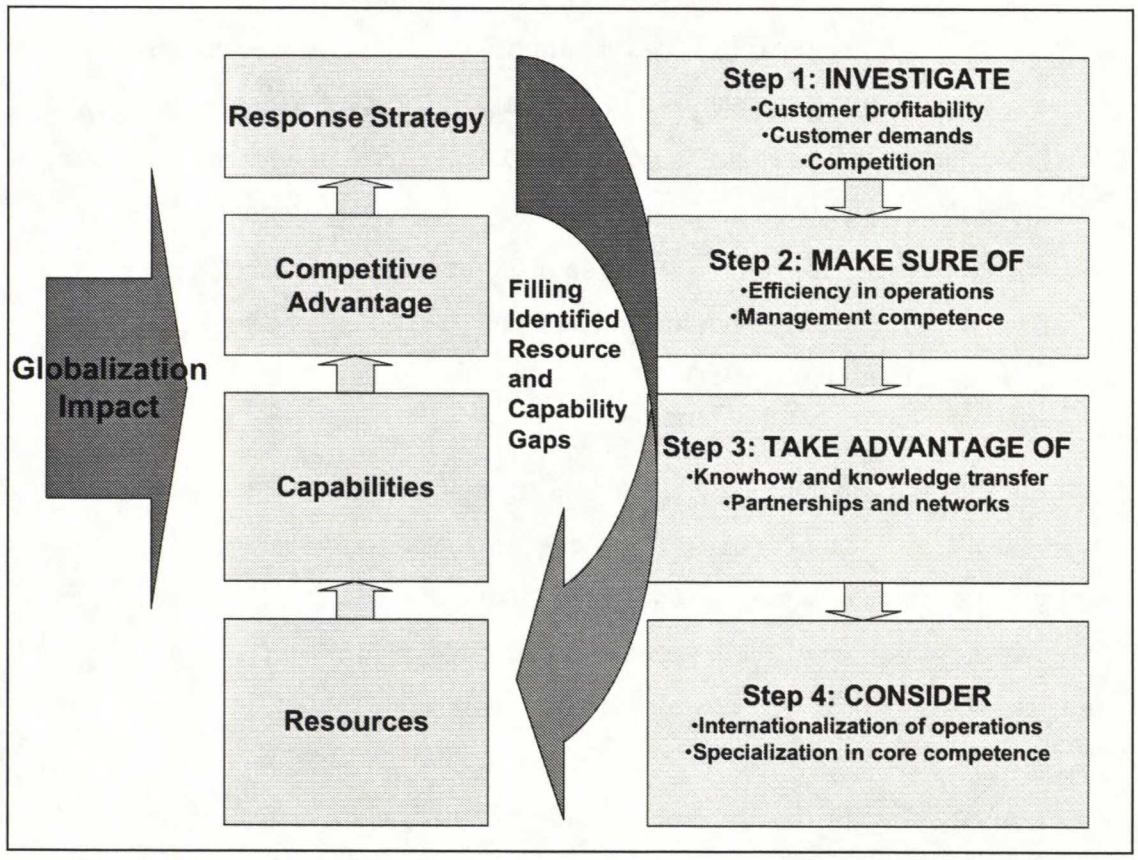

Figure 6 Theoretical framework for globalization impact on mechanical engineering value network and the responses of industry suppliers

This section has presented a theoretical framework for globalization impact on mechanical engineering value network and the response strategies of industry suppliers. Now, the following chapter will go on to describe the empirical study.

3. RESEARCH DESIGN

This chapter introduces the research design and methods used to carry out the empirical study. The choice of a quantitative research approach and more specifically, the survey strategy applied in this study are explained. The case setting, respondents, and units of analysis are presented. The data collection and analysis methods are described. Limitations and the validity and reliability of the study are discussed.

It is appropriate to use a quantitative research methodology as a collection of techniques for organizing, presenting, summarizing, communicating, and drawing conclusions from data, so that it becomes informative (Morris, 2003, 1-2).

Surveys are useful in gathering scientific information. They provide an opportunity to examine correlations in responses thus identifying possible patterns of cause and effect (McBurney & White, 2007, 237). Identifying patterns of company behavior and underlying factors is key in this study. Therefore, the survey approach is chosen as a research strategy for this study. It must be noted here, that the selected approach is a research strategy, not a research method as many methods can be incorporated in the use of surveys (Denscombe, 2003, 7).

According to Denscombe (2003, 145) it is appropriate to use a questionnaire when dealing with large numbers of respondents in many locations. In this study, the respondent population is large and scattered all over Finland. In order to get a reliable, comprehensive picture of the companies in the field of mechanical engineering, this study applies use of a questionnaire as a research method.

Alternatively, a qualitative approach could have been chosen, focusing on selected companies and applying a case study strategy. For less coverage but more detail and depth in answers, this would have been beneficial (Denscombe, 2003, 28). It is likely, however, that qualitative approach would have only grasped the globalization impact and response strategies of a certain company, making the results less reliable and generalizable to the industry as a whole.

The contact information database of Tietoset Oy consisting of thousands of people in Finnish mechanical engineering was used in this study. The company cooperates in large numbers with both mechanical engineering suppliers and industrial buyers in Finland. Therefore, the contact information is up to date and relevant for the purposes of this research. Especially important for the practicalities in conducting the study is to have individual email addresses for the respondents. This was accomplished with Tietoset database. Also, access was an issue. With the researcher working for Tietoset Oy, access to the database was guaranteed.

Alternatively, the member company listing of the Federation of Technology Industries in Finland could have been used in forming the survey sample. This would have perhaps enhanced the credibility of the study results. However, the idea was turned down for three reasons. First, the member companies are relatively larger in size and generally better off than many companies not enrolled as members. This may eventually have caused some bias in the end results. Second and more importantly, the database lists member companies but lacks the detailed contact information, for instance email addresses for key people within the company, therefore making it very difficult to reach the respondents. Third, nearly all of the Technology Industries member companies were also present in the Tietoset database.

The three target groups of the research were the following:

1. Original equipment manufacturers (top-level customers in the value chain)
2. System suppliers (first level suppliers in the value chain)
3. Subcontractors (second and third level suppliers in the value chain)

The scope of the questionnaire formation was twofold as a result of the dissimilar roles of the groups in the value network. First, the study is interested in the sourcing and supplier relationship management of OEM's to see the impact on their subcontractors from this angle. Second, the study wants to investigate sales and customer relationships management of subcontractors and system suppliers to get a perspective from the other side of business transactions. For these reasons, the three distinctive research groups, OEMs, system suppliers and subcontractors, have been approached each with a different set of questions.

The survey sample was set to consist of slightly over 3 000 people who work in mechanical engineering companies in Finland in management level positions; mainly in OEM purchasing or supplier management, sales or production. It is important to note here that the sample is not random and also other limitations are in effect, which will be introduced in detail in the section 3.4. Therefore, the results obtained are not statistically generalizable to the entire population. Nevertheless, it must be noted that database is a very comprehensive representation of the population, so therefore the results are expected to reflect the reality to great extent.

The objective in the quantitative research was to get a minimum of 100 responses for each of the three target groups: OEM's, system suppliers and subcontractors with the total response rate exceeding 10 %. As a smaller number of respondents are expected to work in the system supplier companies, this segment could therefore be smaller in size.

3.1 Data Collection – Survey

This section describes the data collection survey methodology in more detail. A web-based questionnaire was chosen as the research method.

There were three main reasons for choosing a web-based questionnaire approach. First, an Internet survey provides a fast and inexpensive alternative to mail surveys, telephone, and face-to-face questionnaires in collecting survey data (Denscombe, 2003, 42). Second, a large respondent sample was obtainable this way. Third, the process of data analysis was made easier as data output was already in the form of MS Excel spredsheet. Equally important is that with Internet-based questionnaires all the respondents could be identified (Morris, 2003, 52 – 54). This increases the reliability of the results as outsiders, unless they have access to email of the respondent, cannot enter answers into the database.

In search for a tool to conduct the web-based questionnaire it turned out that the Helsinki School of Economics, unlike many other institutes of higher education in Finland, lacks license rights to any web-based questionnaire software. Therefore,

alternatives were needed. After major setbacks with free software that lacked sufficient functionality and reliability, the commercial software providers were turned to. The sales director of Finnish web-based survey software provider Webropol Oy was contacted, who granted the right to use their product free of charge to conduct the web questionnaire.

The first version of the questionnaire was completed in Excel and revised with the help of Antti Siiskonen, the Managing Director of Tietoset Oy, Harri Jokinen, the SME internationalization program leader in the Federation of the Finnish Technology Industries, and a couple of fellow students. The questionnaire was aimed to be easy for the respondents to follow and fill in, yet comprehensive enough to cover the topics of research interest in sufficient depth.

The choice of a language for the questionnaire was Finnish. The reasons for choosing Finnish were practical. First, a significant proportion of the respondents, subcontractors in particular, would not be capable of answering in a foreign language – English. Second, having a questionnaire in English would automatically have narrowed down the respondents and caused respondent self-selection bias. Third, forcing respondents to answer in a foreign language would have limited the quality and depth of answers, particularly in open-ended questions.

A balance between open and closed-ended questions was needed in order to finalize the survey questionnaire. McBurney (2007) makes a distinction between open and closed-ended questions. First, open-ended questions that permit the respondents to answer in their own words are likely to reveal the reasoning behind the respondent answers. This enables finding out issues not anticipated in advance. On the other hand, open-ended questions are harder for respondents to answer and difficult to systematically analyze. Second, closed-ended questions that limit the respondents to choose from predetermined answers are easy for the respondents to answer and simple to code and analyze. On the downside however, closed-ended questions tend to suggest alternatives to respondents that they would not have come up with themselves thus resulting in biased or simplistic answers. (McBurney et al. 2007, 238 – 39)

The final version of the questionnaire was a mixture of both closed-ended and open-ended questions. The main body of the questionnaire consisted of closed-ended questions. The main reason for this was their standardized nature and suitability for this kind of large study. Towards the end of the questionnaire, the importance of the following open-ended questions was emphasized to respondents. Thereafter they were given the opportunity to use their industry knowledge to expand on the key topics such as the globalization impact and response strategies of the firms. Using a mix of both question types in this study is expected to give the benefits of both easy coding and analysis of answers as well as receiving more depth and detail in the answers.

The design of the Webropol software permitted to easily type in questions in various forms including tick-in answers and text-entry boxes. Also, different research target groups were well addressed by having different sets of questions and automatic jump-overs to correct questions respective to the answers received. In general, the software provided an attractive, interactive and colourful questionnaire platform, which may have encouraged a greater amount of respondents to give their answers (Denscombe, 2003, 42).

The respondents were invited to complete the web-based questionnaire in June, a few days before Midsummer and the beginning of the summer holiday season. Delayed launch was due to problems in finding a suitable software provider as described earlier. Dozens of emails bounced back immediately announcing that the respondent was on holiday already. It is therefore likely that the timing resulted in a relatively low response rate.

Another contributing factor to low response rate was that the commercial survey software provider surprisingly closed the access to questionnaire from respondents in early July without any notification. For this reason, those recipients who tried to provide their answers after their summer holidays were not able to do so. The respondents were not reminded to fill in the survey because the access for further respondents into the software was denied. However, although the sample was not randomly selected, randomness and in turn statistical generalizability was probably enhanced by these constraints.

3.1.1 Respondents

This section introduces the respondents of the survey. A total of 323 respondents accepted the invitation to participate in the study and filled in the web-based questionnaire.

The answers were gathered in approximately a week's time, after which the software provider closed down the access to survey unanticipatedly. The following provides an overview of the respondents. In the first table, the respondents are divided according to the target groups of the research. The second table provides information about the positions of the respondents in their organizations. However, in the study, respondent answers are analyzed and presented anonymously to protect respondent privacy and confidentiality.

Table 1 Target Groups and Respondents

Target Groups	Number of Respondents	% of Total Respondents
OEMs	124	38,4%
System Suppliers	82	25,4%
Subcontractors	117	36,2%
TOTAL	323	100%

Table 2 Respondent Positions

Respondent Position	Number of Respondents	% of Total Respondents
Managing Director	90	27,9%
Chairman of Board	18	5,6%
Director in Sales	27	8,4%
Director in Purchasing	41	12,7%
Director in Production	75	23,2%
Employee in Sales	4	1,2%
Employee in Purchasing	22	6,8%
Employee in Production	10	3,1%
Other (e.g. entrepreneurs)	36	11,1%

Table 1 shows that the respondents are divided into the target groups quite nicely and evenly. As anticipated, the system supplier group is slightly smaller than the other two. However, this spread is satisfactory and adds to the generalizebility of the results.

As the table 2 illustrates, the respondents are in the most central positions in their business making their answers really valid and important to the study. Indeed, more than one third of the respondents represent either managing directors, chairmen of the board, or business owners. They are the ones who know their business the best. These combined with operational director level respondents make up of more than 80 percent of all respondents.

It was surprising to find that so many people high up in the organizations took part in the study. It may be that these top executives considered the research topic important and therefore wanted to contribute. Also, it may signal that the message was successful in encouraging the key people to participate. The latter assumption is further supported by the significantly lower response rate of lower management and employee level respondents. It is likely that they refused the invitation feeling that they were not the right people to answer on behalf the company. It is probable that this respondent self-selection process (McBurney et al. 2007) eventually worked in favor of the study producing more valid and reliable responses.

3.1.2 Units of Analysis

This section describes the units of analysis of this study. In this study units of analysis are individual people, more specifically managers of companies in the field of mechanical engineering in Finland. These individuals represent their companies and thus provide expert insight on how the respective companies see the industry.

Alternatively, companies could have been chosen as the units of analysis. This was turned down for three reasons. First, the individual opinions surveyed are "personal opinions" and thus do not necessarily reflect the real orientation and state of the companies. Second, it is possible for more than one person from the same company to

fill in the questionnaire making it difficult to merge the answers into one. Third, it is ultimately a management task to execute strategies for the companies and respond to globalization. Therefore, it makes sense to take a managerial rather than a company perspective.

3.2 Data Analysis

Having described the methods of data collection, this section now explains the methods of data analysis used in the study.

Data analysis is an analytic process that 1) identifies the key components of the phenomenon, here globalization impact on mechanical engineering and firm response strategies, and 2) arrives at the underlying principles that explain the phenomenon (Denscombe, 2003, 119 – 125).

The web-based questionnaire provided a lot of data to analyze. The advantage of the web-based software is that the data reduction – the process of transcribing data from individual data sheets to a summary form (McBurney et al. 2007, 154) is avoided as the data is already in computerized summary spreadsheet format. Thereafter, it is logical to continue using the help of computer in managing the data. In general, computers offer many advantages in this. Denscombe (2003, 275 – 280) concludes the advantages as 1) storage of data, 2) coding of data and 3) retrieval of data. In this study all three are taken advantage of with the main tools being Webropol's data management software, MS Excel and SPSS.

At the beginning of the analysis the data was grouped according to the respondent group. OEM respondents formed the first group, system suppliers the second, and subcontractors the last. This division enables the use of cross-group comparisons. At the second stage, all the answers were reviewed to find out whether there are some clearly non-accurate responses, outliers, that need to be eliminated partially or entirely so that they do not bias the results. In general, the data quality was high and relevant with only a few clear outliers. Contributing factors to high data quality were probably high participant knowledge on their business, as well as the ease of filling in the web-

based questionnaire, and guaranteed security in recording and handling the data as the answers were already in computerized spreadsheet format. To make sure of no data getting lost, a backup of original data was stored in both Webropol software and in a computer.

After the classification of data and removal of invalid data the analysis was begun. As discussed in the section 3.1, closed-ended questions are easy to analyze and cross-compare. Open-ended questions are a challenge, as they contain a lot of important information, but coding the hundreds of answers is likely to be a time consuming task. This study applied a technique of data categorization to summarize the data of the open-ended questions (McBurney et. al. 2007, 238 – 239). The items were ranked according to the number of times they were mentioned.

In the statistical analysis the answers to closed-ended questions were ranked according to the number of times they were mentioned by the respondents. This analysis was done for each of the three segments – OEMs, system suppliers, and subcontractors – both separately and jointly.

The fundamental idea of analysis was to compare and contrast the strategies and management opinions of the system suppliers and subcontractors to their final customers, the OEMs. This way the research aimed to point out some best practices and response strategies to globalization, as well as to identify some drastic differencies in strategical orientation of suppliers and customers.

3.2.1 Measuring Globalization Impact

This section introduces the specific questions used to measure the impacts of globalization on the Finnish mechanical engineering value chain.

As outlined in the model of Gabrielsson et al. (2005), which was the basis for this study, globalization impact is comprehensive and affects resources, capabilities, competitive advantage and ultimately response strategies of the firm. Therefore, it was not feasible to follow the theoretical framework literally and try to make a

distinction between globalization impact on for instance firm's resources and competitive advantage. To ease the respondent answering process and analysis of results it was chosen to deal with a) measures of globalization impact, and b) measures of response strategies.

The left column introduces the research question asked from the survey respondents and the right column provides the rationale for its selection. All the questions are translations from Finnish, used in the survey.

Table 3 Survey Questions Measuring Globalization Impact

SURVEY QUESTION	RATIONALE FOR SELECTION
Industry Change in the Next Ten Years (Analyzed in 4.1.1)	
- What do you think will occur in the Finnish mechanical engineering field in the next ten years as the world markets open and new technologies emerge?	The respondents constitute a group of experts who each possess unique views to the future of the business field. A good way to get a grasp of the future prospects and demands is to ask this from the industry experts.
Financial Performance of Mechanical Engineering Firms (Analyzed in 4.1.2)	
- How has the turnover of your company developed in comparison to one three years ago? a) decreased significantly b) decreased slightly c) remained the same d) increased slightly e) increased significantly f) increased manifold	This question provides one measure for depicting the recent impact of globalization on the overall business growth abilities of the firms in the mechanical engineering industry.
- What do you think the turnover of your company will be in three years from now in comparison to the present? a) decreased significantly b) decreased slightly c) remained the same d) increased slightly e) increased significantly f) increased manifold	This question provides one measure for depicting the expected medium-term impact of globalization on the overall business growth abilities of the firms in the mechanical engineering industry. Here OEM segment is compared to system suppliers and subcontractors to find out whether they correlate at all as they should.
- How has the net income of your company developed in comparison to one three years ago? a) decreased significantly b) decreased slightly c) remained the same d) increased slightly	This question provides one measure for depicting the recent impact of globalization on the overall revenue and financial result generation abilities of the firms in the mechanical engineering industry.

e) increased significantly f) increased manifold	
- What do you think the net income of your company will be in three years from now in comparison to the present? a) decreased significantly b) decreased slightly c) remained the same d) increased slightly e) increased significantly f) increased manifold	This question provides one measure for depicting the expected medium-term impact of globalization on the overall revenue and financial result generation abilities of the firms in the mechanical engineering industry. Here OEM segment is compared to system suppliers and subcontractors to find out whether they correlate at all as they should.
Supplier Portfolio Development **OEM & System Supplier Perspective (Analyzed in 4.1.3)**	
- How has the foreign suppliers' share of your company's total mechanical engineering purchase volume developed in comparison to one three years ago? a) decreased significantly b) decreased slightly c) remained the same d) increased slightly e) increased significantly f) increased manifold	This question gives an indication of the recent internationalization and globalization of the sourcing activities of domestic OEM's and system suppliers.
- What do you think the foreign suppliers' share of your company's total mechanical engineering purchase volume will be in three years from now in comparison to the present? a) decreased significantly b) decreased slightly c) remained the same d) increased slightly e) increased significantly f) increased manifold	This question gives an indication of the expected internationalization and globalization of the sourcing activities of domestic OEM's and system suppliers.
- How has the number of mechanical engineering suppliers to your company developed in comparison to one three years ago? a) decreased significantly b) decreased slightly c) remained the same d) increased slightly e) increased significantly f) increased manifold	The question provides a measure for indicating the recent impact of globalization on the size of the supplier base that the OEM's and system suppliers operate with.
- What do you think the number of mechanical engineering suppliers to your company will be in three years from now in comparison to the present? a) decreased significantly	The question provides a measure for indicating the expected impact of globalization on the size of the supplier base that the OEM's and system suppliers operate with.

b) decreased slightly c) remained the same d) increased slightly e) increased significantly f) increased manifold	
- How has the share of the biggest mechanical engineering supplier to your company developed in comparison to one three years ago? a) decreased significantly b) decreased slightly c) remained the same d) increased slightly e) increased significantly f) increased manifold	The question shows the recent impact of globalization on the dependency of OEM's and system suppliers to their biggest mechanical engineering supplier.
- What do you think the share of the biggest mechanical engineering supplier to your company will be in three years from now in comparison to the present? a) decreased significantly b) decreased slightly c) remained the same d) increased slightly e) increased significantly f) increased manifold	The question shows the expected impact of globalization on the dependency of OEM's and system suppliers to their biggest mechanical engineering supplier.
Customer Portfolio Development **System Supplier & Subcontractor Perspective (Analyzed in 4.1.4)**	
- How has the total turnover share of your company's direct foreign customers developed in comparison to one three years ago? a) decreased significantly b) decreased slightly c) remained the same d) increased slightly e) increased significantly f) increased manifold	This question provides a measure of depicting the recent globalization impact in the growing importance and value of foreign customers to Finnish mechanical engineering system suppliers and subcontractors.
- What do you think the total turnover share of your company's direct foreign customers will be in three years from now in comparison to present? a) decreased significantly b) decreased slightly c) remained the same d) increased slightly e) increased significantly f) increased manifold	This question provides a measure of depicting the expected globalization impact in the growing importance and value of foreign customers to Finnish mechanical engineering system suppliers and subcontractors.
- How has the total number of your customers developed in comparison to one three years ago? a) decreased significantly b) decreased slightly c) remained the same d) increased slightly	This question provides a hint of how globalization has affected the size of the customer base of Finnish mechanical engineering system suppliers and subcontractors.

e) increased significantly f) increased manifold	
- What do you think the total number of your customers will be in three years from now in comparison to the present? a) decreased significantly b) decreased slightly c) remained the same d) increased slightly e) increased significantly f) increased manifold	This question provides a hint of how globalization is expected to affect the size of the customer base of Finnish mechanical engineering system suppliers and subcontractors.
- How has the turnover share of your company's biggest customer developed in comparison to one three years ago? a) decreased significantly b) decreased slightly c) remained the same d) increased slightly e) increased significantly f) increased manifold	The question seeks to find out whether globalization has recently increased or decreased the importance of the biggest customer among the Finnish system suppliers and subcontractors in mechanical engineering. .
- What do you think the turnover share of your company's biggest customer will be in three years from now in comparison to the present? a) decreased significantly b) decreased slightly c) remained the same d) increased slightly e) increased significantly f) increased manifold	The question seeks to find out whether globalization is expected to increase or decrease the importance of the biggest customer among the Finnish system suppliers and subcontractors in mechanical engineering.

3.2.2 Measuring Response Strategies

This section outlines the questions measuring the response strategies to globalization.

As explained in the previous section the theoretical framework is not followed literally in order to arrive at higher quality responses and avoid confusing the respondents. Nevertheless, respondents were asked to simply describe their present business strategy and their opinion on what mechanical engineering system suppliers and subcontractors should do to respond to globalization. Comparing the present and "ideal" supplier strategy should point out some interesting differences in strategies of today and tomorrow.

Also the rate at which the customer-base of suppliers has increased or decreased in past 12 months is investigated. The aim is to find out whether suppliers seek growth by acquiring new customers, are pleased with the current number of customers, or even seek to eliminate customers for better profitability. The next, similar question measures the same thing, but with a time-span of 12 months into the future, and deals with expectations. These expectations, particularly if the respondents say they are eliminating customers, give an indication on whether short-term change in the amount of customers is a result of strategic actions.

The left column introduces the research questions asked from survey respondents and the right column provides a brief rationale for their selection. All the questions have been translated from Finnish to English.

Table 4 Survey Questions Measuring Response Strategies

SURVEY QUESTION	RATIONALE FOR SELECTION
Business Strategies (Analyzed in 4.2.1)	
- Please describe your company's present business strategy.	The business strategy of a company is perhaps the best indicator of how the company seeks to respond to the demands and challenges in the marketplace.
Strategies for Future Success (Analyzed in 4.2.2)	
- In your opinion, what should the mechanical engineering subcontractors and system suppliers do in order to best prepare themselves for the change you proposed? (follows up the previous question – see 3.2.1 – 1st question)	This question goes right to the point by asking the industry experts to bring out their views in regard to the globalization response strategies that they find to be the most useful for Finnish mechanical engineering subcontractors and system suppliers.
Short Term Customer-base Development System Supplier & Subcontractor Perspective (Analyzed in 4.2.3)	
- How many new customers has your company acquired in past 12 months? a) we lost customers b) we cut down the number of customers c) 0 d) 1 e) 2 – 5	This question aims to find out whether the company seeks growth by acquiring new customers or aims to increase profitability by cutting down the number of customers. In any event, it gives an indication of what direction the

f) 6 – 10 g) 11 – 20 h) over 20	industry customer bases are going.
- How many new customers do you think your company is going to acquire in the next 12 months? a) we are going to lose customers b) we are going to cut down the number of customers c) 0 d) 1 e) 2 – 5 f) 6 – 10 g) 11 – 20 h) over 20	The aim of the question is similar to the one above with the exception of this focusing on to the future. This question combined with the accurate figure on the number of customers that firm presently has describes the short-term change in the size of a customer base as a result of strategic actions.

3.3 Limitations

This section presents the limitations of the study. Limitations related to the scope of the study, limitations in regard to the chosen research method, and limitations concerning the timing of the study are discussed.

The study was limited to mechanical engineering companies based in Finland. Therefore the results are not generalizable to other industry segments. Moreover, because of the respondent sample, although large and comprehensive, was not randomly selected, care should be taken in generalizing the results to even the mechanical engineering industry as a whole.

The research method chosen has some limitations of its own. As the industry is fragmented and there are much more small companies than larger ones, the sample may be skewed toward the smaller players. Therefore, it is important the response rate of is high enough so that also the biggest companies are represented to draw an accurate picture. This, however, depends also on the richness of the original company database where the sample is drawn. Using the database of the Federation of the Technology Industries would have put too much weight on large, often multinational companies. On the other hand, drawing a sample from a larger Tietoset Oy database may have put too much weight on the small workshops and therefore have a biasing effect on the outcome.

The chosen research strategy of survey has some disadvantages: 1) tendency to empiricism, 2) detail and depth of data, and 3) accuracy and honesty of responses (Denscombe, 2003, 28). First, the significance of the data can become neglected if it is taken for granted. This way its practical implications are not taken into account. Second, a large-scale research favors breadth of data over depth. Third, reliability and honesty of respondent answers is impossible to guarantee, as it is very difficult to check the accuracy of the responses.

A fully computerized execution of the questionnaire has some pitholes of its own. First, there is always a chance of receiving meaningless data from uncooperative or dishonest respondents. Second, it may be difficult to obtain a truly random sample of respondents because people that take part in a Web-based survey are self-selected (McBurney et al. 2007, 245).

The final limitation worth mentioning is the fact that the mechanical engineering industry is presently on the peak of a long-lasting boom period; order books are filled to historically high level and optimism for the future hinders the strategic planning of many companies. This may well show in the results of this study. For future research, it would be interesting to conduct a similar study during a long lasting depression period, and to compare the results. More suggestions for futher research are discussed in the section 5.4.

3.4 Validity and Reliability

This section provides an assessment of the validity and reliability of the empirical study. There are four types of validity – internal, construct, external and statistical – that must be considered in designing and evaluating a piece of research (McBurney et al. 2007, 169 – 173).

The first measure of validity, *internal validity* (McBurney et al. 2007, 170) is the most fundamental type because it concerns the extent to which a study provides evidence that the independent variable causes the dependent variable to change. This study has strived to rule out alternative variables as potential causes of witnessed events in the

business environment. For instance, the research sample is large enough to rule out possible random errors and selection biases. Also, the respondents are told before they start the questionnaire and reminded during the answering that the questions regarding the industry changes are attributable to the globalization phenomenon.

The second measure of validity, *construct validity* (Ibid, 171) refers to the extent to which the results support the theory behind the research. In other words, would another theory predict the same experimental results? In the case of a Master's Thesis, it is not possible to design a new study that would allow a choice between the competing theoretical explanations of the results. Therefore, the construct validity cannot be ensured.

The third measure, *external validity,* is concerned whether findings are generalizable beyond the current study. Frey, Botan, Firedman, and Kreps (1992, 315) suggest that external validity is maximized in three ways: when subjects of the study are representative of the population to which the results are applied; when research is replicated it should lead to consistent findings; and when a study reflects real-life circumstances. In this study, the first prerequisite holds, as the respondents are part of the target population and the individual respondents can be identified and verified. Moreover, most of the respondents are "high-rank" managers with good knowledge of their respective businesses. The second criterion should hold, though it is yet to be tested. Lastly, the study in this case reflects real-life, real-business circumstances.

The last validity measure, *statistical validity* (McBurney et al. 2007, 173) is similar to internal validity. In this study, although inferential statistics have been used properly the statistical validity cannot be guaranteed. The main reason for this is that the research sample, although very comprehensive, is not a true random sample.

According to Bryman and Bell (2003), *reliability* is concerned with the consistency of measures (Ibid., 74). Denscombe (2003, 273) refers to the classic meaning of reliability, that is whether the research instruments are neutral in their effect and would measure the same result when used on other occasions to the same object. The documentation including the questionnaire questions and respondent companies is provided to enable a later investigator to follow the same procedures to arrive at the

same findings and conclusions. For the sake of confidentiality, the complete respondent listing with the names of the respondents has not been published. However, a list of the companies the respondents represent is included in the Appendix I.

4. RESULTS AND DISCUSSION

This chapter presents the results of the empirical part of the study. First, the survey results in regard to globalization impact on Finnish mechanical engineering value chain are introduced in detail in section 4.1. Second, the survey results regarding the globalization response strategies are outlined as brought up by the respondents in section 4.2. Third, supported by the empirical evidence, a discussion on the response strategies to globalization is provided in section 4.3. In addition, a model of supplier response through value innovation process is introduced.

4.1 Results – Globalization Impact

This section presents the survey results in detail. The questions and their respective answers relate to the impact of globalization on the Finnish mechanical engineering field as seen by the industry experts. The presentation order of the results follows the format presented in section 3.2.1. First, a SWOT-analysis that summarizes the industry suppliers' strengths, weaknesses, opportunities and threats based on the respondent answers is presented.

Table 5 SWOT-Analysis of Industry Suppliers' Resources, Capabilities and Competitive Advantages

STRENGTHS	WEAKNESSES
Innovativeness	Overall operations
Local service	Lack of capacity
Production efficiency	Lack of qualified workforce
Value-added production	Quality defects
Knowhow	Customer relationship management
Product development	Seasonal workload fluctuations
Fast and reliable deliveries	Old-fashioned working culture
High quality	Low confidence in the future
Flexibility	Low exports and internationalization degree
OPPORTUNITIES	**THREATS**
Focus on core competence	Availability of workforce
High tech and automatisation of production	Bulk products sourced out of Finland
Use of foreign workforce	Foreign competition
High service and added customer value	Lack of capacity

Expansion of markets and marketing	Cost of workforce
Networking and partnering	Variable costs
Internationalization of operations	Widening gap between small and large
Development of production methods	Low profitability
Small volume and demanding production	Lack of real industry cooperation
Customer relationship development	Welfare and social politics of Finland
Use of global sourcing	
Seek for "irreplaceble" position	
Use of Russian cost-efficient knowhow	

4.1.1 Industry Change in the Next Ten Years

This section describes the expected change in the industry in the next ten years as a result of globalization impact.

In the questionnaire, industry experts were asked to present their views on what they expect to happen in the Finnish mechanical engineering industry in the next ten years. Their insider opinions give a picture of how globalization is going to affect the overall output of the mechanical engineering value network. Figure 7 below presents the key findings in regard to respondent views of the industry output in ten years, compared to the present.

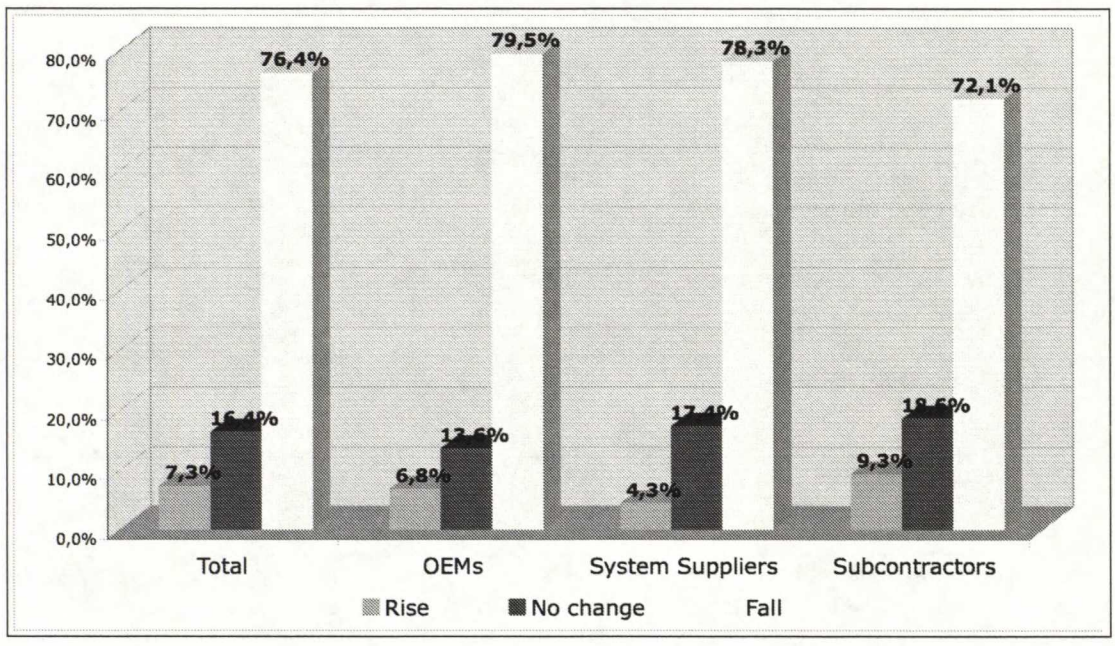

Figure 7 Anticipated Change in the Finnish Mechanical Engineering Output in Ten Years vs. Today

More than 76 % of the respondents expect the domestic manufacturing output to be smaller than what it is now. Some 16 % anticipate no real change to take place and only 7,3 % think that the output is going to be greater in ten years time. Subcontractors are slightly more optimistic than system suppliers and OEMs, which have the least faith in the industry output actually rising.

Table 6 Twelve Most Mentioned Change Scenarios in the Finnish Mechanical Engineering Industry within the Next Tem Years

	Change in the Mechanical Engineering Industry	OEMs	System Suppliers	Subcont-ractors	Total
1.	Increasing concentration on core competence	16,9%	15,4%	10,8%	14,2%
2.	More high-tech, high-knowhow production	17,7%	14,3%	6,9%	12,8%
3.	Simple, volume products no longer produced in Finland	12,9%	8,8%	10,0%	10,7%
4.	Less work (goes to low-cost countries)	12,1%	6,6%	8,5%	9,3%
5.	Large grow and take over small suppliers	3,2%	9,9%	5,4%	5,8%
6.	Business networks and partnerships increase	4,8%	4,4%	7,7%	5,8%
7.	No big changes compared to present	4,8%	4,4%	6,2%	5,2%
8.	Complex, special & small volume products will still be produced in Finland	4,0%	6,6%	4,6%	4,9%
9.	Smaller number of subcontractors	3,2%	4,4%	5,4%	4,3%
10.	Increasing competition	0,8%	2,2%	7,7%	3,8%
11.	Large suppliers internationalize and move abroad	2,4%	4,4%	4,6%	3,8%
12.	OEMs move manufacturing abroad	2,4%	6,6%	3,1%	3,8%

There exists a mutual understanding among the respondents of the ongoing change in the type of mechanical engineering operations that will continue in Finland. Simple, large volume and labor intensive component manufacturing will take place in low-cost countries. The Finnish industry will increase its specialization in high-tech, high knowhow products and manufacturing processes. Many subcontractors see the changes as negative to them; they are afraid of increasing competition, being taken over by a larger supplier or simply going out of business. On the other hand, they are stronger believers in increased networking and partnerships. The system suppliers seem to be growth oriented and they anticipate internationalizing their operations and growing through mergers and acquisitions.

Respondent Comments

On Specialization:

"Those who specialize in innovative products will succeed…"

"Specialization is going to increase as well as partnership-like cooperation…"

"New, highly specialized companies will appear."

"The small companies have a narrow niche that they are specialized in…"

"OEMs concentrate in product development, marketing and delivery channel management…

"Companies must specialize in ever-narrower product segments to remain competitive…"

On Simple, Volume Products:

"Bulk manufacturing diminishes and maybe totally disappears…"

"Bulk products are manufactured elsewhere, specialty products in Finland..."

"In simpliest and volume products manufacturing competitiviness continues to weaken…"

On Sourcing Trends:

"Outsourcing of mechanical engineering companies increases drastically…"

"The share of purchases in total production costs is going to increase while in-house manufacturing is going down."

"Sourcing from the nearby regions is going to increase for sure..."

On Cooperation and Networking:

"Work is concentrated in networks formed around large system suppliers…"

"Business networks are going to grow in importance…"

"Cooperation between the companies becomes tighter…"

On Internationalization:

"Manufacturing is moved to Baltic states and East-European countries, in some cases also to Middle-East…"

"Presence in the developing markets becomes more important than before…"

"OEMs are going to transfer their production to low-cost countries out of EU… Suppliers must follow them..."

"Large mechanical engineering companies grow and internationalize…"

On Mergers and Acquisitions:

"Small workshops, also foreign are taken over by the big companies…"

"Smaller companies become suppliers of the middle-sized ones or alternatively are acquired by the growing companies…"

"The number of small subcontracting companies is perhaps diminishing…"

On Industry Challenges:

"International competition brings along a need to improve competitiveness…"

"Present quality is simply not good enough…"

"Suppliers must expand the size of their markets…."

"There is a lack of qualified workers…"

"Demands on price, quality and documentation are going to increase…"

"As a result of difficulties in getting workforce and its high cost the share of foreign suppliers is going to grow…"

"Some companies are going out of business as there is no one to carry on…"

On Industry Future Prospects:

"The mechanical engineering industry will enjoy an excellent ride for some time, but namely as a result of quality defects a total collapse will follow…"

"Only companies with competitive managers will be successful in the future…"

"The number of medium sized companies goes down…"

"Product development, increases of efficiency and short delivery times keep Finnish mechanical engineering rolling…"

"Key success factors are working supply channels and on time recognition of customer needs..."

"Those companies that develop their operations will survive…"

This section has presented the expected change in the mechanical engineering industry as a result of globalization. Overall, the results inform of a growing concern among industry professionals. In the next section, the financial performance of the companies is inspected in order to find out whether it backs up the results obtained here.

4.1.2 Financial Performance of Mechanical Engineering Firms

In this section, the basic financial data of Finnish mechanical engineering firms is analyzed. In the analysis, the situation three years ago is compared to present, and the present is compared to the anticipated scenario three years from now. This way, the study aims to find out both how the companies are doing now, and what kind of trends there are that tell us about the globalization impact on the industry in the coming years.

Table 7 Present Turnover in Comparison to Turnover Three Years Ago

	OEMs	System Suppliers	Subcontractors
Decreased significantly	2 %	1 %	3 %
Decreased slightly	2 %	0 %	7 %
Remained the same	6 %	5 %	9 %
Increased slightly	31 %	30 %	28 %
Increased significantly	59 %	59 %	50 %
Increased manifold	2 %	5 %	3 %

Table 8 Expected Turnover in Three Years Compared to the Present Turnover

	OEMs	System Suppliers	Subcontractors
Decreased significantly	0 %	0 %	1 %
Decreased slightly	6 %	2 %	9 %
Remained the same	6 %	9 %	9 %
Increased slightly	41 %	38 %	44 %
Increased significantly	42 %	48 %	32 %
Increased manifold	4 %	2 %	5 %

The last three years have been good to the mechanical engineering industry. Turnover is lower now than it was three years ago for only 4 % of the OEM respondents and for 10 % of the subcontractors. For system suppliers, the past three years have been a time of growth, with 94 % of the companies increasing their turnover, vast majority significantly. In general, companies have clearly increased the size of their business as a result of globalization.

Most industry experts believe that globalization is going to show its positive side to the Finnish mechanical industry in the next three years. The vast majority of all respondent segments think that their company's turnover is going to increase even further, although the growth is expected to slow down from the previous three-year period.

Table 9 Present Net Income in Comparison to Net Income Three Years Ago

	OEMs	System Suppliers	Subcontractors
Decreased significantly	5 %	4 %	9 %
Decreased slightly	9 %	6 %	13 %
Remained the same	18 %	20 %	22 %
Increased slightly	31 %	42 %	29 %
Increased significantly	35 %	26 %	21 %
Increased manifold	2 %	2 %	6 %

Table 10 Expected Net Income in Three Years Compared to Present Net Income

	OEMs	System Suppliers	Subcontractors
Decreased significantly	1 %	0 %	1 %
Decreased slightly	9 %	1 %	10 %
Remained the same	13 %	20 %	21 %
Increased slightly	43 %	48 %	45 %
Increased significantly	32 %	31 %	21 %
Increased manifold	2 %	0 %	3 %

Also in regard to net income development, in the last three years the overall development has been rather positive. 68 % of the OEMs, 70 % of the system suppliers, and 56 % of the subcontractors have witnessed a growth net income.

Most respondents have high expectations for the future. Suppliers in particular expect to improve their net income – 69 % of the subcontractors and 79 % of the system

suppliers. Only 1 % of system suppliers and 11 % of subcontractors expect to have a lower net income three years from now. The roots of this positivism may be in the investments in the new production facilities and technolygy that the suppliers have made recently. They expect these investments to pay off in the future.

4.1.3 Supplier Portfolio Development – OEM & System Supplier Perspective

This section investigates the supplier portfolio development from the OEM & system supplier perspective. The objective is to find out what kind of effect globalization has on the number of mechanical engineering suppliers used, the number of foreign suppliers used, and on the importance of the biggest supplier.

Table 11 Supplier Portfolio Development

	OEMs	System Suppliers	Indexed Difference	Total of Both
Use foreign suppliers	72 %	57 %	79	66 %
Share of foreign suppliers < 10 %	38 %	57 %	150	44 %
Share of foreign suppliers > 40 %	13 %	7 %	54	12 %

Table 12 Present Share of Foreign Suppliers in Comparison to Share Three Years Ago

	OEMs	System Suppliers	Difference
Decreased significantly	1 %	0 %	- 1 %
Decreased slightly	0 %	2 %	+ 2 %
Remained the same	26 %	20 %	- 6 %
Increased slightly	48 %	57 %	+ 11 %
Increased significantly	25 %	17 %	- 8 %
Increased manifold	0 %	4 %	+ 4 %
Pearson Correlation Coefficient r-squared		0,92	

Table 13 Expected Share of Foreign Suppliers in Three Years Compared to Share Today

	OEMs	System Suppliers	Difference
Decreased significantly	0 %	0 %	0
Decreased slightly	3 %	2 %	- 1 %
Remained the same	22 %	24 %	+ 2 %
Increased slightly	47 %	41 %	- 6 %
Increased significantly	26 %	33 %	+ 7 %
Increased manifold	1 %	0 %	- 1 %
Pearson Correlation Coefficient r-squared		0,94	

On average, the Finnish OEMs are more international in the use of a foreign mechanical engineering suppliers. The globalization impact here is clearly visible – more and more purchases are made to foreign companies. Only 1 % of the OEM respondents and 2 % of the system suppliers claim that their purchase volume to foreign suppliers has decreased in the past three years.

The same trend is expected to continue in the upcoming three years. The system suppliers in particular are going to increase their purchase volume to foreign suppliers even further. Overall, this can be interpreted as alarming news to the Finnish subcontractors who seem to be losing their component manufacturing to foreign subcontractors.

Table 14 Average Number of Mechanical Engineering Suppliers of OEMs & System Suppliers

	OEMs	System Suppliers	Difference
Number of suppliers	35	17	- 51 %

Table 15 Present Number of Suppliers in Comparison to Three Years Ago

	OEMs	System Suppliers	Difference
Decreased significantly	1 %	0 %	- 1 %
Decreased slightly	10 %	9 %	- 1 %
Remained the same	39 %	37 %	- 2 %
Increased slightly	43 %	46 %	+ 3 %
Increased significantly	7 %	9 %	+ 2 %
Increased manifold	0 %	0 %	0
Pearson Correlation Coefficient r-squared		1,00 * statistically significant p<0,05	

Table 16 Expected Number of Suppliers in Three Years Compared to Today

	OEMs	System Suppliers	Difference
Decreased significantly	3 %	0 %	- 3 %
Decreased slightly	15 %	10 %	- 5 %
Remained the same	40 %	41 %	+ 1 %
Increased slightly	35 %	42 %	+ 7 %
Increased significantly	8 %	7 %	- 1 %
Increased manifold	0 %	0 %	0
Pearson Correlation Coefficient r-squared		0,98 * statistically significant p<0,05	

In the results, there is a lot of variation in the average number of mechanical engineering suppliers used by the company. On average, it seems that the size of a supplier network of an OEM is twice the size of the respective system supplier

network. Despite the common belief, also presented in the introduction of this study, the size of a supplier network has not decreased. On the contrary, 50% of the OEMs and 55% report an increase in the amount of used suppliers and over one third state it to be about the same than three years ago.

The globalization impact on the customer use of mechanical engineering suppliers appears to be that more or at least the same amount of suppliers is needed in three years. Only 18% of the OEMs and 10% of the system suppliers expect to cut down the number of suppliers. However, the results lend support to system suppliers actually approaching OEMs when it comes to the number of suppliers used.

Table 17 Present Share of the Biggest Supplier of Total Purchase Volume

	OEMs	System Suppliers	Difference
0 - 5 %	19 %	17 %	- 2 %
5,1 - 10 %	26 %	27 %	+ 1 %
10,1 - 25 %	36 %	33 %	- 3 %
25,1 - 40 %	9 %	15 %	+ 6 %
40,1 - 60 %	6 %	7 %	+ 1 %
Over 60 %	3 %	0 %	- 3 %
Pearson Correlation Coefficient r-squared		0,92	

Table 18 Present Share of the Biggest Supplier in Comparison to Share Three Years Ago

	OEMs	System Suppliers	Difference
Decreased significantly	0 %	1 %	+ 1 %
Decreased slightly	9 %	7 %	- 2 %
Remained the same	42 %	28 %	- 14 %
Increased slightly	32 %	51 %	+ 19 %
Increased significantly	17 %	12 %	- 5 %
Increased manifold	0 %	0 %	0
Pearson Correlation Coefficient r-squared		0,71	

Table 19 Expected Share of the Biggest Supplier in Three Years Compared to Share Today

	OEMs	System Suppliers	Difference
Decreased significantly	2 %	0 %	- 2 %
Decreased slightly	11 %	16 %	- 5 %
Remained the same	40 %	30 %	- 10 %
Increased slightly	44 %	43 %	- 1 %
Increased significantly	3 %	11 %	+ 8 %
Increased manifold	0 %	0 %	0
Pearson Correlation Coefficient r-squared		0,92	

The results show that on average, the share of the biggest mechanical engineering supplier is relatively small; most commonly 10 – 25 % of the total purchase volume of the customer. The dependency on the biggest supplier has generally increased in the last three years – 49 % of the OEMs and 63 % of the system suppliers are now buying more from the biggest supplier relative to other suppliers.

In the next three years, the importance of the biggest supplier will remain stable or still continues to grow, but with a slower pace than before. Some 13 % of the OEMs and 16 % of the system suppliers estimate that the significance of the biggest supplier is going to be smaller in three years than what it is now. In general, however, the results support the prediction of many that a smaller number of suppliers will be responsible for a greater number of jobs.

4.1.4 Customer Portfolio Development – System Supplier & Subcontractor Perspective

This section investigates the customer portfolio development from the system supplier and subcontractor perspectives. The objective is to find out what kind of effect globalization has on the number of customer mechanical engineering suppliers have, the number of direct foreign customers, and on the importance of the biggest customer.

Table 20 Share of Foreign Customers

	System Suppliers	Subcontractors	Indexed Difference	Total of Both
Have direct foreign customers	68 %	38 %	56	50 %
Share of foreign customers < 10 % of turnover	50 %	54 %	108	53 %
Share of foreign customers > 40 % of turnover	20 %	21 %	105	20 %

Table 21 Present Turnover Share of Direct Foreign Customers in Comparison to Three Years Ago

	System Suppliers	Subcontractors	Difference
Decreased significantly	0 %	5 %	+ 5 %
Decreased slightly	2 %	20 %	+ 18 %
Remained the same	23 %	20 %	- 3 %
Increased slightly	44 %	30 %	- 14 %
Increased significantly	31 %	20 %	- 11 %
Increased manifold	0 %	5 %	+ 5 %
Pearson Correlation Coefficient r-squared		0,71	

Table 22 Expected Turnover Share of Direct Foreign Customers in Three Years Compared to Today

	System Suppliers	Subcontractors	Difference
Decreased significantly	2 %	0 %	- 2 %
Decreased slightly	0 %	9 %	+ 9 %
Remained the same	15 %	41 %	+ 26 %
Increased slightly	48 %	45 %	- 3 %
Increased significantly	33 %	5 %	- 28 %
Increased manifold	2 %	0 %	- 2 %
Pearson Correlation Coefficient r-squared		0,41 * significant difference	

The results show that the system suppliers are more internationalized than subcontractors, when it comes to having direct foreign customers – 68 % of the system suppliers presently have direct foreign customers, in contrast to 38 % of the subcontractors. Interestingly, 25 % of the subcontractors say that the significance of direct foreign customers is smaller today than it was three years ago. Only 2 % of the system suppliers agree. This may mean that globalization has in fact turned some subcontractors away from international markets and more into serving domestic system suppliers and OEM customers.

On the other hand, the expectations of both system suppliers and subcontractors prove that the direct foreign customers are going to grow in importance – 83 % of the system suppliers and 50 % of the subcontractors anticipate the turnover share of direct foreign customers to grow. The high figure of the system suppliers indicates that they clearly have internationalization and market expansion strategies in mind.

Table 23 Present Number of Customers in Comparison to Three Years Ago

	System Suppliers	Subcontractors	Difference
Decreased significantly	1 %	3 %	+ 2 %
Decreased slightly	12 %	15 %	+ 3 %
Remained the same	28 %	30 %	+ 2 %
Increased slightly	45 %	40 %	- 5 %
Increased significantly	13 %	12 %	- 1 %
Increased manifold	1 %	0 %	- 1 %
Pearson Correlation Coefficient r-squared		0,98 * statistically significant p<0,05	

Table 24 Expected Number of Customers in Three Years Compared to Today

	System Suppliers	Subcontractors	Difference
Decreased significantly	1 %	1 %	0
Decreased slightly	12 %	18 %	+ 6 %
Remained the same	21 %	41 %	+ 20 %
Increased slightly	57 %	36 %	- 21 %
Increased significantly	9 %	3 %	- 6 %
Increased manifold	0 %	0 %	0
Pearson Correlation Coefficient r-squared		0,61 * notable difference	

Both system suppliers and subcontractors have on average increased slightly the size of their customer base over the last three-year period. 59 % of the system suppliers and 52 % of the subcontractors reports the same. However, despite the favourable demand pull in the market, many of the suppliers have not taken new customers or have actually decreased the number of customers. This could be a sign of higher production volumes going to the most important customers.

It is interesting to see that as high as 41 % of the subcontractors expect to keep the number of customers at the current level in the coming years. This satisfaction to the present situation is not so common to system suppliers, of which 66 % aim to get new customers. Are the subcontractors pessimistic, realistic, or just not willing to grow their business? Maybe they seek growth through increasing the production volumes to current customers.

Table 25 Biggest Customer Share of the Supplier Turnover

	System Suppliers	Subcontractors	Difference
0 – 10 %	11 %	6 %	- 5 %
10,1 - 25 %	24 %	32 %	+ 8 %
25,1 – 40 %	36 %	32 %	- 4 %
40,1 – 60 %	11 %	18 %	+ 7 %
60,1 – 80 %	12 %	9 %	- 3 %
Over 80 %	8 %	3 %	- 5 %
Pearson Correlation Coefficient r-squared		0,77	

Table 26 Present Turnover Share of the Biggest Customer in Comparison to Share 3 Years Ago

	System Suppliers	Subcontractors	Difference
Decreased significantly	3 %	5 %	+ 2 %
Decreased slightly	18 %	15 %	- 3 %
Remained the same	21 %	25 %	+ 4 %
Increased slightly	34 %	32 %	- 2 %
Increased significantly	21 %	21 %	0
Increased manifold	3 %	3 %	0
Pearson Correlation Coefficient r-squared		0,96 * statistically significant p<0,05	

Table 27 Expected Turnover Share of the Biggest Customer in 3 Years Compared to Share Today

	System Suppliers	Subcontractors	Difference
Decreased significantly	3 %	1 %	- 2 %
Decreased slightly	20 %	22 %	+ 2 %
Remained the same	38 %	36 %	- 2 %
Increased slightly	30 %	31 %	+ 1 %
Increased significantly	9 %	9 %	0
Increased manifold	0 %	1 %	+ 1 %
Pearson Correlation Coefficient r-squared		0,98 * statistically significant p<0,05	

The results reveal that the turnover share of the biggest customer for a mechanical engineering supplier is generally less than 40 %, and most often 25 – 40 %. However, there are quite a few companies who are heavily dependant on one single customer. For one fifth of the system suppliers and 12 % of the subcontractors, the biggest customer represents more than 60 % of their total turnover; for some companies the share is as high as over 80 %. The importance has increased along with globalization – 58 % of system suppliers and 56 % of subcontractors report an increase over the last three-year period.

When looking at how globalization is expected to change the situation in the next three years, the majority of respondents expect to see a slower growth for the biggest customer share of the turnover. 61 % of the system suppliers and 59 % of the subcontractors see no growth at all for the biggest customer.

4.1.5 Profiles of Mechanical Engineering Industry Actors

In this section, the mechanical engineering industry actors are portrayed based on the results obtained in the questionnaire. As the research sample is not a randomly selected representation of the population, the profiles must not be taken too literally. However, it is likely that the profiles describe the underlying globalization trends and influences in the different actors of the mechanical engineering industry.

The profiles are summarized in the table below. In the left column, a portrait of a typical Finnish OEM is presented with an emphasis on business growth and sourcing operations. In the middle column, a typical Finnish mechanical engineering system supplier is introduced with a focus on business growth, sourcing, and sales. In the right column, a domestic mechanical engineering subcontractor is profiled specifically in regard to business growth and customer relationship management.

Table 28 Profiles of Mechanical Engineering Industry Actors

Original Equipment Manufacturer	System Supplier	Subcontractor
Turnover growth:		
- Slight or significant in the last 3 years - Only slows down slightly in the next 3 years	- Significant in the last 3 years - Only slows down slightly in the next 3 years	- Slight in the last 3 years - Slows down slightly in the next 3 years
Net profit:		
- Improved slightly in the last 3 years - Expected to improve further in the next 3 years	- Improved slightly in the last 3 years - Expected to improve further in the next 3 years	- No significant improvement in the last 3 years - Expected to improve somewhat in the next 3 years
Number of mechanical engineering suppliers:		
- Average of 35 suppliers - Unchanged or increased slighly in the last 3 years - Expected to decrease slightly in the next 3 years	- Average of 17 suppliers - Increased somewhat in the last 3 years - Expected to increase but with a slower rate in the next 3 years	N/A
Foreign mechanical engineering suppliers:		

- 72 % use foreign suppliers - Share of foreign suppliers is 10 – 25 % of total purchase volume - Share has increased slightly in the last 3 years - Similar growth rate expected for the next 3 years	- 57 % use foreign suppliers - Share of foreign suppliers is less than 10 % of total purchase volume - Share has increased slightly in the last 3 years - Similar or even higher growth rate expected for the next 3 years	N/A
Share of the biggest mechanical engineering supplier:		
- 10 – 25 % of total purchase volume - Increased slightly in the last 3 years - Expected to increase but with a slower rate in the next 3 years	- 10 – 25 % of total purchase volume - Increased somewhat in the last 3 years - Expected to increase but with a slower rate in the next 3 years	N/A
Number of customers:		
N/A	- Average of 64 customers - Increased slightly in the last 3 years - Expected to increase further with a similar growth rate in the next 3 years	- Average of 78 customers with a lot of variation - Unchanged or increased somewhat in the last 3 years - Expected to remain constant with no major changes in the next 3 years
Share of direct foreign customers:		
N/A	- 10 – 25 % of total turnover - Increased slightly in the last 3 years - Expected to increase further at a higher rate in the next 3 years	- Less than 10 % of total turnover - Increased somewhat in the last 3 years - Expected to increase further at a slower rate in the next 3 years
Share of the biggest customer:		
N/A	- 25 – 40 % of total turnover - Importance has increased somewhat in the last 3 years - Expected to increase in importance but with a slower rate in the next 3 years	- 25 – 40 % of total turnover - Importance has increased slightly in the last 3 years - Expected to increase in importance but with a slower rate in the next 3 years
New Customers:		
N/A	- Less than 5 in the last 12 month period - Even lower number of new customers expected for the next 12 months - 25 % takes no new customers or even cuts down the number of existing ones	- 2 – 5 in the last 12 month period - Lower number of new customers expected for the next 12 months - 25 % takes no new customers or even cuts down the number of existing ones
Customer profitability:		
N/A	- Less than 10 % of customers are non-profitable for the company - One third of the companies have no means to measure the customer profitability	- Less than 10 % of customers are non-profitable for the company - Majority of the companies (60 %) have no means to measure the customer profitability

4.2 Results – Response Strategies

This section presents the results of the empirical study in regard to response strategies. The objective is to present the industry expert opinions as the basis for the response strategies that mechanical engineering companies should use to respond to the inevitable globalization impact. The presentation order of the results follows the format presented in section 3.2.2. First, business strategies are reviewed. Second, strategies to ensure future success are investigated. Lastly, short-term customerbase development as a response strategy is examined.

4.2.1 Present Business Strategies

In this section, business strategies of the companies in the industry are examined. Looking at the business strategies of the system suppliers and the subcontracting companies should well reflect the underlying means that they are currently using in responding to globalization and the changing marketplace.

On the other hand, the strategies of original equipment manufacturers should provide some hints on how the customer strategic orientation as well as the demands are changing and what strategic direction the suppliers should take in order to respond to them. The table below summarizes the respondent answers in regard to the present business strategy followed in the company. The results are presented segment-wise and according to the number of times mentioned.

Table 29 Summary of the Present Business Strategies of Mechanical Engineering Companies

Components of Present Business Strategy	OEMs	System Suppliers	Subcont-ractors	Total
Customer orientation	9,1%	10,2%	**10,8%**	9,9%
Focus on core competence	7,9%	6,8%	**12,6%**	9,1%
Internationalization	**13,9%**	6,8%	0,9%	8,2%
Cost-efficiency in operations	7,9%	**8,0%**	7,2%	7,7%
Delivery accuracy and rapidity	1,8%	5,7%	**11,7%**	5,8%
Investments in production technology	4,8%	5,7%	**7,2%**	5,8%
Assemblies and after-sale services	**6,7%**	3,4%	4,5%	5,2%
Increase of the customer value added	**4,8%**	4,5%	4,5%	4,7%
High production quality	1,8%	3,4%	**7,2%**	3,8%
Knowhow and expertise	3,6%	**4,5%**	3,6%	3,8%
Focus on serving the key customers	1,8%	**5,7%**	5,4%	3,8%

Flexibility	2,4%	1,1%	**6,3%**	3,3%
Development of work processes	**3,6%**	2,3%	2,7%	3,0%
Acquisition of more customers	3,0%	2,3%	**3,6%**	3,0%
System suppliership	1,2%	**6,8%**	1,8%	2,7%
Development of sourcing (low-cost)	**4,8%**	1,1%	0,9%	2,7%
Development of customer relationships	1,2%	3,4%	**3,6%**	2,5%
Product development	**3,6%**	2,3%	0,9%	2,5%
Use of business networks	**3,6%**	2,3%	0,0%	2,2%
Adaptation to change	1,2%	**3,4%**	1,8%	1,9%
Outsourcing manufacturing operations	**3,0%**	0,0%	0,0%	1,4%
Diversified operations	1,2%	**2,3%**	0,0%	1,1%
Improvement of brand & marketing	**1,8%**	1,1%	0,0%	1,1%
Growth through acquisitions	**1,2%**	1,1%	0,0%	0,8%
Profitable growth	0,6%	**2,3%**	0,0%	0,8%
Focus on environmental issues	**1,2%**	1,1%	0,0%	0,8%
Replies on proposal requests	0,0%	**1,1%**	0,9%	0,5%
Hiring personnel	0,0%	**1,1%**	0,9%	0,5%
Training of personnel	0,6%	0,0%	**0,9%**	0,5%
Increase of in-house manufacturing	**1,2%**	0,0%	0,0%	0,5%
	100,0%	100,0%	100,0%	100,0%

Several interesting points stand out in the cross-segment analysis of the data.

1. *Internationalization* is strongly present in the contemporary strategy of OEMs where as practically none of the subcontractors have it in their strategy. See also Figure 8.
2. Recent hot topic in the industry, *use of business networks*, seems to be only used by the OEMs and some system suppliers – not at all by the subcontractors.
3. The majority of subcontractors rely on old-fashioned strategy based on high quality, delivery accuracy and flexibility. Their customers, OEMs and system suppliers, in contrast take these as a given. A *new mindset for subcontractor strategy formation is needed* to stand out from competition. See also Figure 8.
4. In general, *business strategy as a concept seems unclear* to many of the professionals in the industry. The respondent strategy is often a mixture of vision, mission and specific business objectives. The downside is that a non-sense strategy is more difficult to turn into practice, profits, and into effective response to globalization.

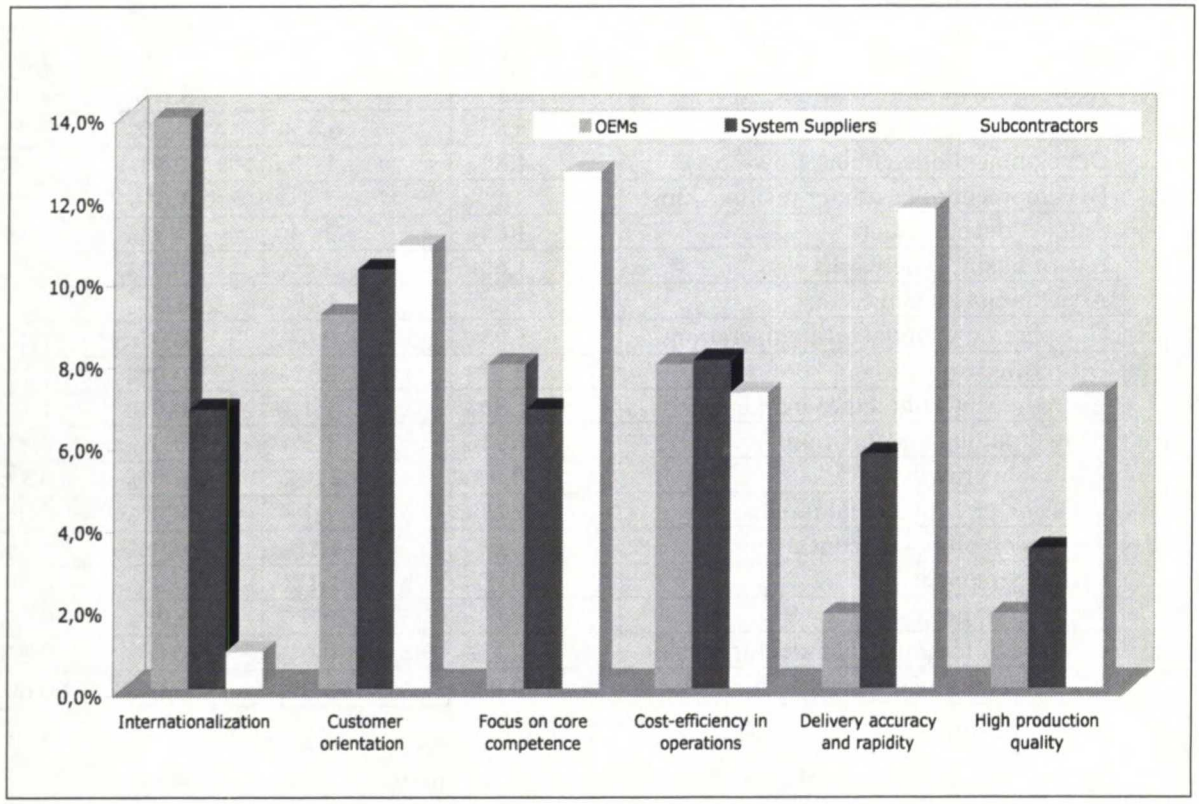

Figure 8 Six Most Common Components of Strategy Used in Mechanical Engineering Companies

Respondent Comments

On Business Strategy in General:

"In this company strategy is badly organized…"

"An objective oriented operation is vastly missing…"

"Unfortunately there is no clear strategy… we apply a case by case strategy in our operations…"

On Customer Relationship Management:

"We have selected about 4 – 5 key customers, with whom cooperate closely… a similar number of other customers, of which some will later become key customers..."

"We focus on a few key customers with whom we have long contracts…"

"We offer our clients comprehensive service also in components including purchase, inventory, logistics…"

On Internationalization:

"Manufacturing process is going to be replaced out of Finland…"

"Domestic unit becomes a proto workshop with concentration in product design, sales and marketing…"

"Assembly of products going into the European markets as well as the administration of foreign production units will take place in Finland…."

On Elements of the Strategy:

"Machining and welding with manual machines... we do it profitably, despite low volumes..."

"Final assembly, trial runs, and the most significant manufacturing processes are kept in house…"

"We utilize an effective supplier network…"

"We take advantage of low-cost manufacturing…"

"We have invested in most modern machining technology, business software systems and control of entire process…

4.2.2 Strategies for Supplier Success in the Future

This section outlines the strategies for suppliers to secure their success in the globalizing marketplace. OEMs, system suppliers, and subcontractors alike have recommended these strategies.

In a rapidly changing business environment, the business strategy applied today may not necessarily be the most successful one for tomorrow. In the questionnaire, the respondents were asked to present their views on the winning supplier strategies for the next ten-year period. In the following table, these strategies are summarized segment-wise and in the order that follows the frequency of the occurrence.

Table 30 Supplier Strategies to Secure Success in the Next 10-Year Period

Strategical Move	OEMs	System Suppliers	Subcont-ractors	Total
Investments to secure competitiveness	13,3 %	15,3 %	***19,3 %***	15,7 %
Formation of business networks	8,5 %	12,6 %	***18,5 %***	12,7 %
Training to secure know-how	11,5 %	10,8 %	***13,4 %***	11,9 %
Focus on core competence	9,7 %	9,0 %	***10,9 %***	9,9 %
Improved cost-efficiency in operations	***7,3 %***	5,4 %	5,0 %	6,1 %
Development of work processes	***6,7 %***	5,4 %	2,5 %	5,1 %
High production quality	***7,3 %***	2,7 %	3,4 %	4,8 %
Internationalization	4,8 %	***6,3 %***	3,4 %	4,8 %
Development of sourcing (low-cost)	4,8 %	***5,4 %***	3,4 %	4,6 %
Product development	4,2 %	***4,5 %***	2,5 %	3,8 %

Development of customer relationships	3,0 %	***4,5 %***	4,2 %	3,8 %
Moving production abroad	***4,2 %***	2,7 %	2,5 %	3,3 %
Increase of flexibility	2,4 %	1,8 %	***2,5 %***	2,3 %
Increase of productivity	***4,8 %***	0,0 %	0,8 %	2,3 %
Increase of the customer added value	***3,0 %***	1,8 %	0,8 %	2,0 %
Hiring foreign people	0,6 %	***4,5 %***	0,8 %	1,8 %
Increase of assembly operations	1,2 %	***2,7 %***	0,8 %	1,5 %
Improved brand image, sales&marketing	1,2 %	***1,8 %***	0,8 %	1,3 %
Focus on serving the key customers	0,6 %	0,0 %	***2,5 %***	1,0 %
Improved logistics	0,0 %	0,9 %	***1,7 %***	0,8 %
Acquisition of more customers	0,6 %	***1,8 %***	0,0 %	0,8 %
	100 %	100 %	100 %	100 %

The results seem to indicate that subcontractors are firm believers in technology investments and networking to respond successfully to globalization. The subcontractor perspective differs from that of the OEMs – nearly 40 % of the subcontractors find new investments in technology and networking important in comparison to slightly over 20 % of the OEMs. On the other hand, the OEM respondents highlight also other factors of supplier strategies that add to their value. These factors include improvements in supplier cost-efficiency, productivity, quality, processes and overall ability to add customer value and if needed, establish production abroad.

Interestingly, networking is valued as a successful response strategy by many of the subcontractor respondents (18,5 %), but as shown in section 4.2.1, is not presently strategically exercised by any of the same respondents. Similarly, training and knowledge transfer rank high in the future success strategies of the respondents, but the present strategies of the suppliers largely ignore it.

Table 31 Supplier Response Strategies Accorging to Popularity in Cross-Group Comparison

OEMs	System Suppliers	Subcontractors
Cost-efficiency	Internationalization	Investments in technology
High-quality	Low-cost sourcing	Business networks
Processes development	Product development	Training
Productivity	Customer relationships	Core competence
Production abroad	Foreign workers	Flexibility
Customer value	Assemblies	Key customers
	Brand, sales & marketing	Logistics
	More customers	

In Table 31 above, the strategy focus points of the respondent segments are presented. The points most emphasized by the respective segment in comparison to other two segments are placed in the same column.

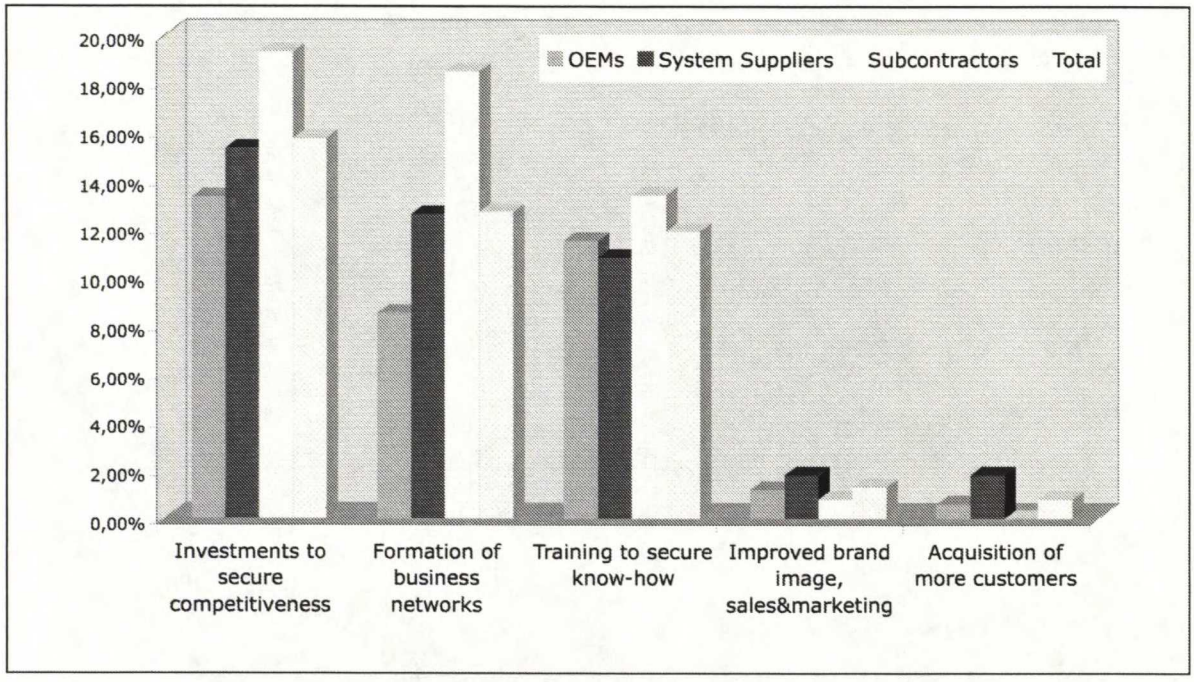

Figure 9 Three Most Important Strategic Moves Compared to Perceived Importance of Sales & Marketing

Finally, looking at the results from a marketing perspective provides support to those who argue that sales and marketing are not strengths of the Finnish businesses. As shown in Figure 9 above, in mechanical engineering industry, only a small minority of the respondents seem to consider sales, marketing and brand improvement worth investing in over other elements of the strategy. Some of the system suppliers have strategic interests for getting new customers. Interestingly, none of the subcontractors do. The results seem to indicate that suppliers think that "being good at what we do is enough to bring us the customers without any further efforts needed".

Respondent Comments

On Investments:

"Invest in development and training functions…"

"The newest technology must be taken into use throughout the company…"

"Use of leading edge technology... (and) newest, open hierarchy based enterprise software applications..."

"Investing in customer service is a must as it pays off..."

"The highest technology, high mutual trust based R&D cooperation with the customers and candidly taking advantage of information systems are the key words..."

"Hire more qualified personnel..."

On Internationalization:

"International operations must increase in many levels..."

"One must be actively involved in going to developing markets side by side with the customers..."

"Take advantage of foreign low cost manufacturing..."

"Sourcing directly from foreign suppliers in a profitable price..."

On Development of Processes:

"Supplier must develop and enhance one's own knowhow and products..."

"Supplier must be the one who has the knowhow and outsource manufacturing from others that are competitive in it..."

"If something is promised, it should be done as well..."

"Improve operational efficiency by increasing productivity..."

"Develop manufacturing process by making investments to remain competitive..."

"More accurate and proper grasp of operations is needed..."

On Points of Focus:

"Take advantage of low-cost components..."

"Keep knowhow at a high level in products that are going to be manufactured in Finland..."

"Assume responsibility in coming up with the most cost-effective solution on behalf of the client..."

"Seriously think of the competitiviness of the firm in the future..."

"Concentrate in getting new customers..."

"Learn to calculate the total cost of manufacturing... knowing just direct variable costs is not enough..."

On Specialization:

"Specialize in a narrow segment producing smaller series using high technology… (or) larger ensambles focusing on serving a few customers from product development to guarantee- and service needs…"

"Supplier needs to specialize in an area which one knows to be a strength…"

"Focusing in one's own expertise is still a success factor…"

On Networking and Partnering:

"Form genuine and open networks to fight low-cost production…"

"Share knowhow with one another and engage in competition rather abroad…"

"Increase cooperation… form networks also with foreign companies…"

4.2.3 Short-Term Customerbase Development – System Supplier & Subcontractor Perspective

This section investigates the short-term customerbase development from the system supplier and subcontractor perspectives. The objective is to find out whether the short-term customer data reflects changes that could be considered a globalization response strategy applied by the suppliers.

Table 32 Number of New Customers Suppliers Acquired within the Past 12 Months

	System Suppliers	Subcontractors	Difference
Lost customers	1 %	1 %	0
Eliminated customers	11 %	16 %	+ 5 %
0 new customers	8 %	7 %	- 1 %
1 new customer	8 %	8 %	0
2 – 5 new customers	47 %	47 %	0
6 – 10 new customers	13 %	12 %	- 1 %
11 – 20 new customers	8 %	3 %	- 5 %
> 20 new customers	4 %	5 %	+ 1 %

Table 33 Number of New Customers Suppliers Expect to Acquire in the Next 12 Months

	System Suppliers	Subcontractors	Difference
Lose customers	0 %	0 %	0
Eliminate customers	13 %	17 %	+ 3 %
0 new customers	12 %	8 %	- 4 %
1 new customer	16 %	16 %	0
2 – 5 new customers	39 %	45 %	+ 6 %
6 – 10 new customers	9 %	10 %	+ 1 %
11 – 20 new customers	7 %	1 %	- 6 %
> 20 new customers	4 %	3 %	- 1 %

The results indicate that some suppliers – 11 % of the system suppliers and 16 % of the subcontractors – have in fact eliminated customers over the past 12-month period. Termination of customer relationships is a strategic decision. This is in line with resource-oriented theories, ROT (Vesalainen, 2004, 23) (See Chapter 2). The assumption can be made that these suppliers have wanted to focus resources and production capacity on their key customers, who in turn have increased their purchasing volume.

However, most of suppliers have acquired some new customers in the past 12 months. Nearly 50 % of both system suppliers and subcontractors have gotten 2 – 5 new customers.

The results show that most system suppliers are going to take less new customers in the following 12 months with 41 % of them expecting one or fewer new customers. The subcontractors behave similarly, with the exact same share of the companies expecting less than one new customer.

To sum up this section, many suppliers have responded to globalization challenges and opportunities by not actively taking in new customers at the moment. It is difficult to say whether this just a present trend or if it is a long-lasting, defensive strategy to get the customers and to grow them.

4.3 Discussion

In this section the obtained results from the two previous sections are synthesized. The objective is to make some general suggestions for companies in the field as supported by the empirical evidence.

The key points addressed in this section include:

- Supplier response stragies resemble one another
- Meaningful differentiation is needed
- Value innovation as a strategic logic
- Discrepancies between OEM and supplier strategies

The results of the study support the argument that there are many strategic paths for mechanical engineering suppliers to choose to respond to globalization. Nevertheless, responding to globalization, putting together global strategy, and changing the organization to allow implementation is a complex task to do – even most of the U.S. multinationals lag in their response to globalization (Yip, 1994, 23).

The problem in Finnish mechanical engineering is that far too many industry suppliers focus on benchmarking industry competitors rather than thinking about how to meaningfully stand out from the competition by creating superior buyer value. Unfortunately, this leads the suppliers to engage in fierce domestic competition with one another, all using the same weapons in the battle.

However, today's increasingly global competition cannot be made irrelevant by having a business strategy centered on the ever so common "high-quality products, reliable deliveries and flexible service" mantra. In fact, customers today take those cornerstones of supplier business for granted. The Finnish suppliers need to understand that if they want to take full advantage of globalization and grow profitably, they must make strategic moves that meaningfully differentiate their product offering and eventually make the competition irrelevant.

Value innovation (Kim & Mauborgne, 2005) is recently introduced strategic logic that may provide some guidance also to mechanical engineering firms in search for

profitable growth in uncontested market space. In their study of 150 strategic moves over the past 100 years in thirty different industries, Kim and Mauborgne (2005) found that the approach to strategy separated the winners from the losers. Losers follow the conventional approach, racing to beat their competition within the existing industry order. Winners, however, focus on making the competition irrelevant by creating so-called "blue oceans" through value innovation: pursuing both differentiation and low cost simultaneously. (Ibid, 2005)

Table 34 Conventional Strategy Approach vs. Value Innovation Approach (Kim & Mauborgne, 2005, 48 – 79)

Conventional Strategy	Value Innovation "Blue Ocean Strategy"
Define the industry similarly and focus on being the best within it.	Look across alternative industries.
Look at the industry through the lens of generally accepted strategic groups and work hard to stand out in the selected strategic group.	Look across strategic groups within industries.
Focus on the same buyer group, be it the purchaser, the user or the influencer.	Look across the chain of buyers.
Define the scope of product and service offering in the industry similarly.	Look across complementary product and service offerings.
Accept the industry's functional or emotional orientation.	Look across functional or emotional appeal to buyers.
Focus on the same point in time and often on current competitive threats in formulating strategy.	Look across time.

Value innovation is a combination of value and innovation with equal weight: Value without innovation is merely value creation, while innovation without value tends to be too futuristic or technology-driven for buyers to accept and most importantly, to pay for (Kim et al., 2005, 12 – 13). In order to break the trade-off between differentiation and low cost and to come up with value innovation, a supplier in mechanical engineering needs to rethink the prevailing business model and the industry's strategic logic. The following four key questions (applied Kim & Mauborgne, 2005) can be used in the process:

1) Which of the factors that the mechanical engineering suppliers have taken for granted should be *eliminated*?

2) Which factors should be *reduced well below* the mechanical engineering industry standard?
3) Which factors should be *raised well above* the mechanical engineering industry's standard?
4) Which factors should be *created* that the mechanical engineering industry has never offered?

To take this value innovation process a step further, the research results are used to come up with an example of a value innovation model for a mechanical engineering supplier.

Table 35 Value Innovation Strategy for a Mechanical Engineering System Supplier

Value Innovative Strategy for a Mechanical Engineering System Supplier
Step 1. Eliminate: • Unprofitable and low-profit customers • Flexibility toward customers with excess, unused capacity
Step 2. Reduce: • Waste (time, raw material & excess inventory) • Complexity of ordering • Price (hand in hand with purchasing volume increase)
Step 3. Raise: • Internationalization (sales & sourcing) • Performance based bonuses for personnel • Automation and work process development • Networking, partnering and acquisition of customers from various different industries • Environmental friendliness in operations
Step 4. Create: • Information systems with in-built work in progress data, proposal calculations, automatic order processing and raw-material purchasing • Ease of ordering and work load predictability • Incentives for customers to order in advance

The benefits of the above-described strategy can perhaps be best seen when the elements are broken down into a) cost reducing, and b) value creating items. This can be seen in the table 36 below.

Table 36 Cost Reduction and Value Proposition to Buyers

Cost reductions	Value proposition to buyers
Elimination of non-profitable customers	Ease of ordering
Elimination of costly "flexible, always ready" strategy involving keeping excess unused capacity for customers	Price incentives with regular, on-time and advance orders
Reduction of waste in production, order processing, human resources	Access to information systems ease communication and bring the supplier "closer" to buyer
Motivated personnel bring the best results and least unanticipated expenses	Environmental friendliness of the supplier is always a positive thing for the buying company

It must be emphasized that the strategy outlined above only serves as an example and a starting point for discussion, not a complete strategy for each and every supplier to follow. In the field of Finnish mechanical engineering, there exist a wide variety of different firms with different types of expertise. Nevertheless, this study has shown that far too many of the suppliers compete with the same traditional methods. It is probable that these methods are not the best possible to successfully meet the challenges of globalization.

Supported by the empirical evidence, the business strategies of the OEMs and the suppliers often do not go hand in hand. The use of foreign suppliers has increased and continues to do so with more and more OEMs establishing manufacturing facilities closer to their markets.

Those suppliers that have a chance to internationalize their operations, use foreign low-cost sourcing, and establish production units close to their customers should do so. The smaller sized subcontractors should evaluate their business strategy and find out whether they have placed themselves as "just another fish in the sea". If so, they can find the uncontested waters in which to swim through the strategic process of value innovation introduced in this section. In value innovation, small things can in fact be big issues that enable the supplier to secure his position in the globalizing market place of mechanical engineering.

5. CONCLUSIONS

This chapter provides conclusions to the current research. The chapter is divided into four sections. First, the research and its purpose are summarized. Second, the main findings of the study are explicitly stated. Third, the managerial implications of the study are presented. Finally, the paper ends with suggestions for further research.

5.1 Research Summary

This section provides reasoning for the study and outlines the research objectives and the methods applied in the study.

The purpose of this study was to investigate the globalization impact on the Finnish mechanical engineering value network and the response strategies of system suppliers and subcontractors. The study was motivated by the recent booming years in the industry, combined with the increasing and outspoken concerns of many in regard to the future of this important industry to Finnish economy as a whole.

The research questions that the current study set out to answer were twofold:

1) What is the globalization impact on the Finnish mechanical engineering value network?
2) What are the globalization response strategies, particularly of system suppliers and subcontractors?

The objective of the first question was to broaden understanding of globalization impact on mechanical engineering. The theoretical framework for the globalization impact was constructed in Chapter 2 and used as the foundation upon which to build the empirical study. The nine themes in regard to globalization impact on mechanical engineering value network, resources of firms, and competitive advantages of firms were outlined as follows:

Globalization impact reviewed in Section 2.1:

1. *Customer demands (Kuikka, 2007; Helm, Rolfes and Günter, 2006)*

- Customer demands are rising

2. *Competition (Gomory & Baumol, 2004; Gabrielsson et al., 2005)*
   - Competition is increasing

Resources reviewed in Section 2.2:

3. *Management importance (Koskinen, 2006; Yip, 1994)*
   - Management importance is rising
4. *Knowhow management (Kogut & Zander, 2003; Koskinen, 2006)*
   - Knowhow management is becoming increasingly important
5. *Partnerships and networks (Ritter & Gemünden, 2003; Vesalainen, 2004, 2006; Möller et al., 2004)*
   - Networking and partnerships are on the rise
6. *Customer relationship profitability (Helm, Rolfes & Günter, 2006; Zolkiewski & Turnbull, 2002; Vesalainen, 2004)*
   - Customer relationships are turning profitable
7. *Operational efficiency (Wagner & Friedl, 2007; Siiskonen, 2007)*
   - Efficiency is replacing inefficiency in operations

Competitive advantage reviewed in Section 2.3:

8. *Internationalization of operations (Gemser, Brand & Sorge, 2004; Luostarinen & Gabrielsson, 2004)*
   - Businesses are turning increasingly international
9. *Specialization (Pulkkinen, Rajahonka, Siuruainen, Tinnilä & Wendelin, 2005; Eisenhardt & Martin, 2000; Möller & Svahn, 2003)*
   - Specialization is taking over diversified operations

A model that combines the theoretical and empirical perspectives of the study will be presented in Section 5.3.

The second question was examined from both theoretical and empirical perspectives. The literature review touched upon the response strategies and the theoretical framework introduced in Chapter 2 served as the basis of the strategies presented. Then, the empirical study was conducted with the intention of verifying the presented potential response strategies and getting some other angles into the subject matter.

The empirical part of the study consisted of a web-based questionnaire that was put out to get industry insider views on the globalization opportunities and challenges as well as strategic moves that could be beneficial for the industry suppliers in the years to come. The questionnaire was answered by 323 industry professionals, of which one third represented either Managing Director or Chairman of the Board level respondents.

The target groups were defined to be a) original equipment manufacturers, b) system suppliers and c) subcontractors.

In the data analysis, an effort was made to draw a big picture of the globalization impact on mechanical engineering value network, so that the results were a solid foundation to the new strategic thinking put forward in the discussion. The main findings are presented in the next section.

5.2 Main Findings

This section presents the main findings of the study. The two research questions are answered.

The empirical research brought up important evidence on the strategies in use by industry suppliers and buyers alike. This information was used in constructing a new value innovation based strategy for the suppliers. First, the key issues in regard to globalization impact on mechanical engineering value network are outlined. Second, the supplier response strategies and the model of value innovation are introduced.

Globalization Impact

The results show that in general, the impact of globalization on Finnish mechanical engineering is positive. The OEMs have largely benefited from the increase in international trade and a favorable world economy. Mechanical engineering suppliers have enjoyed a record high level of orders, which has enabled them to invest in new production technologies and specialize in core competencies, serving only a narrow

segment of customers. The current findings are consistent with the findings of the Technology Industries' Visionary Committee (Hernesniemi, 2007).

However, there is a noticeable downside. The results show that a vast majority of the respondents anticipate industry output to go down, mainly as a result of high volume, labor-oriented subcontracting being done abroad in the future. OEMs are increasingly internationalizing their operations on all levels; from foreign sourcing to establishing manufacturing facilities closer to their key markets.

On the other hand, subcontractors show lack of willingness to internationalize and to revise their strategies in order to be competitive in a new environment. The findings indicate that the industry supplier segment is going to be strongly divided into a) growing and internationalizing system suppliers, and b) small and locally operating specialized subcontractors.

The OEMs clearly are international and their current business strategies aim to increase their international operations further, be it international sales, manufacturing, or purchasing. The system suppliers can respond to this by internationalizing alongside their customers, keeping up their competitiviness by improving cost-efficiency in operations, taking advantage of their own low-cost sourcing, and increasing customer value with high knowhow, high service assemblies, and units.

Response Strategies

This study shows that subcontractors compete with traditional and very similar strategies. Most rely simply on high quality, delivery accuracy, and flexible customer service.

Other than tough competition, their challenges include lack of qualified labor, lack of capacity, management of operations and customer relationships, as well as learning out of an old-fashioned working culture. The threat is that the subcontractors do not detect the internationalization of their customers early enough, and therefore overlook the need to constantly develop their work processes, productivity, and cost-efficiency.

Alongside keeping up the competitiviness by increasing productivity and cost-efficiency, industry suppliers must enhance their sales, marketing, and new-customer acquisition. It is alarming to see from the results that none of the 117 subcontractor respondents see new customer acquisition as a possible success strategy and a method of profitable growth.

Equally concerning is how little the subcontractors can tell about the overall profitability of their customer relationships. The results indicate that a majority of the subcontractors have neither the tools nor the methods to measure the profitability of their customer relationships. In this regard, the findings of the current study lend support to the study of Helm, Rolfes, and Günter (2006) in German mechanical engineering.

Overall, the Finnish mechanical engineering suppliers are technology oriented, which is largely good for the industry. Technology leadership can surely be an advantage for the domestic suppliers who can not compete in terms of cost-leadership due to high labor costs. A combination of high tech, cost-efficient production, along with some other value innovation element could be used to build an "irreplaceable" value proposition for the customer; thus responding effectively to globalization.

5.3 Managerial Implications

This section presents the managerial implications of the study – a model of globalization response through value innovation for a mechanical engineering supplier. Also the second research question – *What are the globalization response strategies, particularly of system suppliers and subcontractors* – is thoroughly answered.

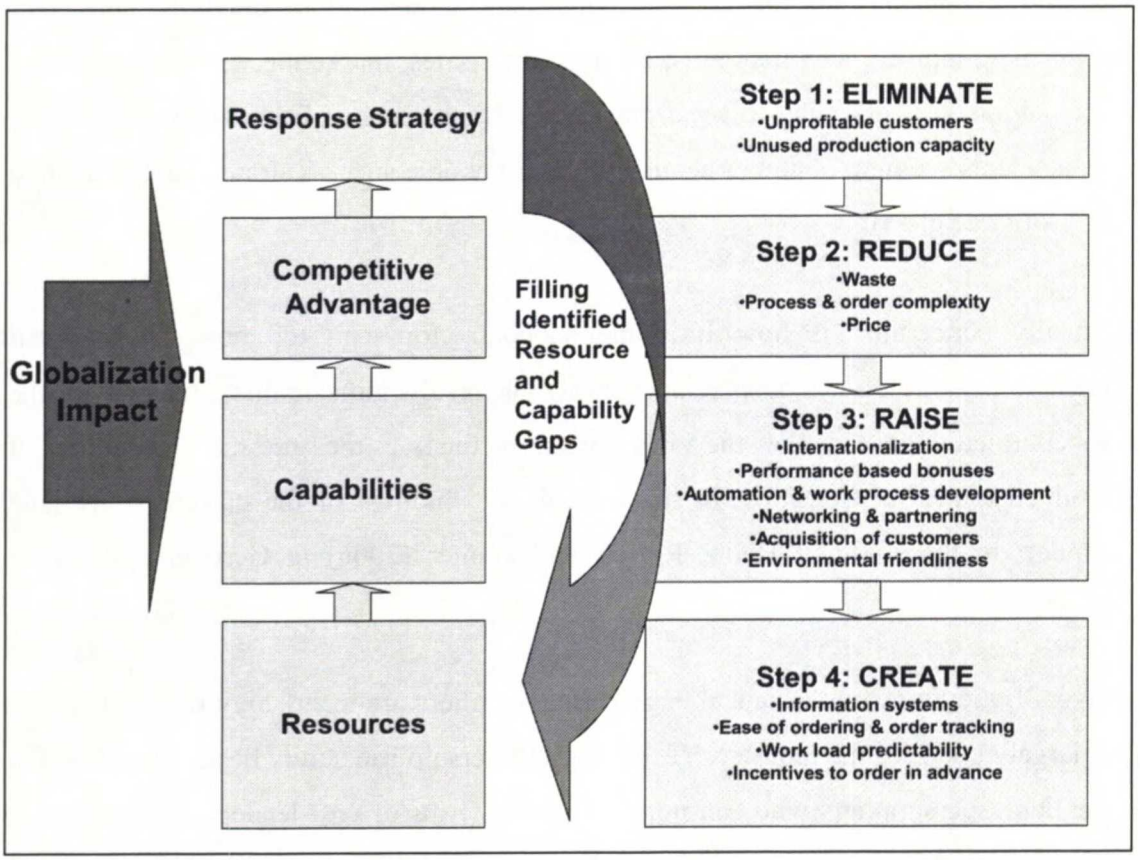

Figure 10 Model of Globalization Response Through Value Innovation for a Mechanical Engineering Supplier (Based on Kim & Mauborgne, 2005; Gabrielsson et al., 2005)

In Chapter 4, respondents identified the following weaknesses in the operations of domestic mechanical engineering suppliers:

- Not managing operations efficiently
- Lack of production capacity
- Lack of qualified workforce
- Problems with quality defects
- Lack of knowledge about how to manage customer relationships
- Problems with seasonal workload fluctuations
- An old-fashioned working culture
- Low confidence in the future
- Lack of international mindset or experience

These results indicate that in order to respond to globalization impact, suppliers need to address many fundamental problems in regard to gaps in their resources and capabilities. It would be advisable to tackle these issues step by step.

The model of globalization response through value innovation presented in Figure 7 offers one way of addressing points for improvement. It is important for mechanical engineering suppliers to continuously rethink their strategy and product offering in terms of: 1) what to eliminate, 2) what to reduce, 3) what to increase, and 4) what to create. In a global marketplace, benchmarking the competition is not the way to get ahead of the competition because it is not innovative. To succeed, one must be an innovator.

The implications of this study are now presented in four distinctive steps, as illustrated in Figure 10. First, factors that should be eliminated are discussed. Second, aspects that should be reduced are presented. Third, issues that could be raised to higher importance are reviewed. Finally, new factors that could be created are highlighted.

Eliminate

The problem of having unprofitable customer relationships is common for many suppliers. Suppliers should not have customers that are not profitable or are less profitable than available alternatives. If the terms of the customer relationship cannot be made more profitable for the supplier, for instance though increased volumes, the relationship should be ended.

Another problem for many suppliers is the lack of production capacity. In general, production capacity is only fruitful when it is in full use. A supplier should always aim to manufacture at full capacity. Indeed, there is no reason to have excess unused capacity waiting for orders that may or may not come in from the key customer. Flexibility and unused capacity should be eliminated by binding agreements with the key customers and filling in the excess capacity with other customers.

The factors that suppliers can rather easily eliminate or at least avoid to a great extent have now been presented. While some issues cannot be eliminated fully, they can still be minimized. These topics will be addressed in the second step of the model of globalization response.

Reduce

The second step of the model of globalization response deals with factors to be reduced. Waste of time, raw material, resources, overproduction and inventory translates into waste of money. However, not a single business should waste money. Supplier processes should be streamlined and innovatively developed together with the personnel so that waste is minimized.

Moreover, price is under constant pressure to go down. In the globalizing markets of mechanical engineering, component prices are going down. Therefore, suppliers should acknowledge this fact and develop their operations accordingly, so that the price per unit can be continuosly lowered.

This step has addressed the subjects suppliers should reduce to minimum. The third step of the model describes the issues suppliers can raise above industry standards.

Raise

The third step of the model of globalization response addresses factors to be raised in importance. As the customerbase is internationalizing, localization is not a counterforce for internationalization. Rather, suppliers should internationalize their operations at all levels in order to respond to globalization impact.

Furthermore, personnel input is a major determinant of output quality. Therefore, suppliers should attempt to increase levels of employee commitment. For example, they can take advantage of performance-based bonuses to be able to acquire, retain, and motivate qualified labor. When employees are intrinsically motivated to do their job well, it is likely to result in improved quality, productivity, and less employee absencies and wasted resources.

Another concern for improvement is automation and use of new technologies. New technologies emerge rapidly and automation is replacing traditional labor. Suppliers should utilize the newest technologies and develop work processes to raise productivity.

Markets are becoming increasingly networked. A final product is no longer a result of the efforts of a single company, but a result of joint efforts of many companies working together. Suppliers should engage in networks and partnerships that raise their ability to compete successfully in a changing marketplace.

Furthermore, raising attention to having a diversified customerbase is important. Heavy dependency on a single or few key customers from a similar customer segment is not a wise strategy for a supplier to pursue. If that one industry segment goes down, the whole business is in jeopardy. Suppliers should acquire customers from different industries and grow them to roughly equal sizes to avoid such problems in advance.

Last point in regard to factors to be raised above industry standards is environmental friendliness. Conservation of natural resources and environmental friendliness of operations are definitive considerations of contemporary manufacturing businesses. In the future, customers have an obligation to demand environmental responsibility from their suppliers. Those suppliers who have raised their environmental standards to match the growing demands will be in a strong position.

This third step of the model of globalization response through value innovation has discussed factors suppliers should raise to a higher degree of importance in their strategies. The final step introduces some issues, new in mechanical engineering, that suppliers could create.

Create

There is a need for more information systems in mechanical engineering. Successful businesses of the 21st century have one thing in common: they are extremely good at managing information. Also mechanical engineering companies should create information systems to use information to their advantage. Ideally, a supplier could manage all the information, including data about works in progress, proposal calculations, order processing, as well as raw-material and component purchasing, in one system.

Additionally, in regard to information, customers want to have easy, less time-consuming ways to make orders and follow them in real-time during the

manufacturing process to ensure just-in-time delivery. Suppliers are encouraged to provide their customers information systems that ease up the order and follow-up procedure. These systems can be created as a joint effort of several suppliers within the network for the benefit of all.

Finally, it is increasingly important for suppliers to determine the expected workload and production capacity use well in advance to raise overall productivity. Therefore, suppliers should provide incentives for their customers to order in advance and stick to their order specifications. This way suppliers can even out their workload fluctuations, and if possible, use excess capacity for other customers.

The four steps of the model of globalization response through value innovation have now been introduced. It is suggested that managers in mechanical engineering suppliers apply and adapt the model in their strategic planning. In the final section of this study suggestions for further research are introduced.

5.4 Suggestions for Further Research

This section puts forward suggestions for further research. There are numerous ways this study could be continued or to impart on related research in the avenues of globalization impact and response strategies of firms.

Three suggestions for continuing this study are put forward. First, further analysis of the existing data could be done. Further statistical analysis could provide new angles that may have been overlooked in the current study. Second, qualitative interviews could add further insight and provide answers to micro-level issues from the companies' point of view. Third, it would be interesting to repeat the study in two to three years, and again in three to five years. This type of longitudinal study would be likely to better capture the impacts of globalization on the Finnish mechanical engineering industry. Moreover, this type of study could reveal how companies have responded, while also bringing out new response strategies.

The current study also paves the way for further research into related topics. Two ideas are proposed. First, carrying out a similar study in an international setting could be explored. For instance, a comparative study could be conducted in Italy, for example, where the mechanical engineering industry is also significant for the economy as a whole. This would provide a more comprehensive perspective on how the European mechanical engineering industry is impacted by globalization. Second, to gain a more inclusive understanding of how the Finnish economy as a whole is impacted by globalization, another industry, such as the wood processing industry, could be investigated.

Finally, further research in general is needed on mechanical engineering, this vitally important field of the Finnish economy. It is crucial that the research recommendations are taken into practice, in order to prevent the fate of the electronics industry from being repeated in the mechanical engineering industry. SITRA, the Finnish Innovation Fund, has recently acknowledged this pressing need for action and results. SITRA has recently launched a three-year program for the development of a network-based operating model to promote the growth and internationalization of the machine and metal industries.

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Appendices

Appendix I. Respondent Companies

The Companies the Respondents Represent		
Aaltoviiva Oy	Kolmeks Motors Oy	Pöytyän Koneistuspalvelu Oy
ABB Oy Motors	Konecranes Heavy Lifting Oy	PT-Components Oy
Abloy Oy	Konecranes Oy	Pujoma Oy
Ahmotuote Oy	Koneistus Heinonen	Puska Crew Oy
Aker Yards	Koneistustyö Heikkilä Oy	Pyhäsalmen Metallityö Oy
Aker Yards Cabins Oy	Koneistustyö Lehtelä Oy	Py-tas Oy
Aliko Automation Oy	Kone-ja Metalliasennus Erkintalo	Raahen Terästuote Oy
Alphaform RPI Oy	Konepaja Eurakon Oy	Rantsilan Mekamet Oy
Alutig Ky	Konepaja Ketola Oy	Ratesteel oy
Anaika Group ltd oy	Konepaja Korhonen Oy	Rauman Työkaluvalmistus Oy
Aristeel Oy	Konepaja P Uusitalo Oy	Raumaster Oy
Ariterm oy	Konepaja Santalahti Oy	Rauno Saari Oy
Aspocomp	Konepaja Stamac Oy	Rautaruukki Oyj
Ata Gears Oy	Konepaja Wiler Oy	Rautaruukki Oyj Ruukki Engineering
Bodycote Lämpökäsittely Oy	Kuljetintekniikka Oy	Rautaseiska Oy
Camtek Oy	Lahden Tasopalvelu Oy	Raute Oyj
Cencorp Oyj	Lahovuo Oy	Reikälevy Oy
CNCenter Oy	Larox	Rekola Oy,Trolley Systems
E.Luhta Oy ltd	Laserle Oy	Rempsun Metalli Oy
Ecomet Oy	Laukamo Plastcomp Oy	Rolls-Royce Oy
Elecster Oyj.	Leimet Oy	Rolls-Royce Oy Ab / Kokkola
Elektromet Yhtiöt Oy	Lejo Network Oy	Sacotec Components Oy
Elematic Oy	Leo Laine Oy	Sah-Ko OY
Elmont Oy	LH Lift Oy	Sammet Asennus Oy
Enics AG (Enics Finland Oy)	Linjalaser Oy	Sampo Hydraulics
Enocell	Logisteel Oy	Sampo-Rosenlew oy
Erkomat Oy	Loval Oy	Sandvik Mining and Construction Oy
Esmig Hitsaus Ky	Luvata Pori Oy	Satateräs Oy
Etelko Oy	Maaseudun Kone Oy	Savira Oy
Etepa teollisuuspalvelu Oy	Mail Systems Oy	Savonia Power Oy
Extron Engineering Oy	Makron Oy	SBA Interior Oy
Fastpap Oy	Malira Oy	Seger Automation Oy
Faumek Oy	Marioff Oy	Seger Oy
Ferrum Steel Oy	Markon Puu ja Metalli Ky	Sento Oy
Finnish Chemicals Oy	Mastsystem Int'l Oy	Sisu Auto Huoltopalvelut Oy
Finn-Power Vilppula	Mecra tekniikka Oy	SKS Toijala Works Oy
Fluidhouse Oy	Mehi Oy	Sormat Oy
Formia Lakeus Oy	MeramaTec Oy	Sorvaamo Juhani Kivi Oy
Fors-Mek oy	MeriMet Oy	Steelpa Oy
Fortek Oy	Merivaara	STERIS Finn-Aqua
Franke Finland	Mesekon Oy	Stratum Oy
GaV Group Oy	Metallikoneistamo Mauri Vuoto	Sulzer Pumps Finland Oy
Gritech Oy	Metallikoneistamo VMS Oy	Sumetek Oy
GS-Hydro Oy	Meteco Oy	Suomen Säiliönpääty Oy
Gunnebo Nordic Oy	Metsi Oy	Taitoks Oy
Hakalan Metalli Oy	Metso Oyj	Talvivaara Projekti Oy
Hala-Tek Ky	Metso Paper Oy	Tammerneon Oy
Halton Oy	Metso Paper Pori Oy Service	Tamware
Heinolan Sahakoneet Oy	Miilukangas Ky	Tasowheel Oy

Helapala Oy	Milltamo Oy	T-Drill Oy
Helkama Forste Oy	Misolan Metalli	Technion Oy
Helsingin Satama	MM-Työkalu Oy	Tehomet Oy
Hits_ari ky	Moduc oy	Teme Metalli Oy
Hitzwetec Oy	Morite Oy	Temelex Oy
Holetec Industrial Oy	Moventas Oy	Tenimet Oy
Hollming Works Oy	Myrkyn Metalli oy	Teräselementti Oy
Hot-Steel Oy	Naaraharju Oy	Termopoint Oy
Huurre Insulation	Nammo Lapua Oy	Thermo Fisher Scientific Oy
Imatran Työstöasennus Oy	Naval Oy	TM-Asennus Oy
Innofocus	Nekopa Oy	Topmec Oy
Itab Oy	Nokian Capacitors	Top-Metalli Oy
Jämsänkosken Teräsvalmiste Oy	Nokka Oy	Transtech Oy
Janavalo Oy	Norcar BSB	TR-meka oy
Jaykon Oy	Nordic Aluminium Oyj	TunturiTec Oy
Jet-Steel Oy	Normet Oy	U-cont oy
John Crane Safematic Oy	Nurmi Hydraulics OY	UPM-Kymmene Oyj
Jokke-Koneistus Oy	Okmetic	Vaasa Engineering Oy
Jousteel Oy	Okmetic Oyj	Vacon Oyj
JPS-Metal Oy	OLP-Tuotanto Oy	Valmet Automotive Oy
JPT Jaskari Oy	Orfer Oy	Valtimo Components Oyj
JTT Konepaja Oy	Oripipe Oy	Valtra Oy Ab
JT-Yhtiöt Oy	Osa-Koneistus Oy	Vapor Finland Oy
Junkkari Muovi Oy	Ossin Metalli Oy	Veekmas Oy
Jupiko Oy	Outotec Turula Oy	Vegamark Oy
Jyrsin-Kierreväline oy	Oy Cyklop Ab	Veslatec
Kaakamon Metalli Ky	Oy Lai-Mu Ab	Vesme Systems Oy
Kaarinan Trimet Oy	Oy Laine-Tuotanto Ab	Vihmerä Ky Karhulan koneistus
Kaarlo Finnilä Oy	Oy M-Filter Ab	Viialan Teräsrakenne Oy
Kalajoen Teollisuusrakenne Oy	Painosorvaamo Painopojat Oy	Ville Vilkman Ky
Kalmar Industries Oy Ab	Parker Hannifin Oy Lokomec	VM-Group Oy
Kari Kivilahti Oy	Patria	VR Osakeyhtiö Pieksämäen konepaja
Kariko oy	Peltolan Metalli	VR Yhtiöt
Katatec Oy	Perlos Oyj	Warkaus Works Oy
Kausalan Terästyö ja Asennus Oy	Pietilä Subcon	Wegera Oy
Kemppi Oy	PISLA OY	Wemigroup Oy
Keski-Suomen Koneistamo Oy	PKC Group Oyj	YIT Rakennus Oy
Kesla Oyj	Plantool Oy	Ylä-Savon Koneistus Oy
Kipeno Ky	Pohjanmaan Konepaja Oy	
Kip-Man Oy	Polttoleikkaus Pukari Oy	
Kit- Sell Oy	Ponsse Oyj	

Appendix II. Quantitative Questionnaire

Konepajateollisuuden tulevaisuudennäkymät

Tämä tutkimus liittyy Mikko Luukkasen Pro Gradu-työhön. Tutkimuksen tarkoituksena on selvittää konepajateollisuuden yritysten tulevaisuudennäkymiä alalla toimivien henkilöiden asiantuntemuksen kautta.

Tutkija pyrkii hahmottamaan kuinka maailmanmarkkinoiden avautuminen ja uusien tuotantoteknologioiden synty vaikuttaa suomalaiseen konepajateollisuuden arvoketjuun ja yritysten tuloksentekokykyyn. Erityisenä kiinnostuksen kohteena on tunnistaa hyviä keinoja ja menestyksekkäitä toimintamalleja, joita alan järjestelmätoimittajat ja alihankkijat käyttävät menestyäkseen muuttuvassa markkinatilanteessa.

Tutkimukseen vastaaminen vie aikaa noin 5-10 minuuttia. Kaikille tutkimukseen vastanneille toimitetaan kiitoksena yhteenveto tutkimuksen tuloksista alkusyksystä. Tätä tarkoitusta varten voitte halutessanne jättää kyselyn lopussa sähköpostiosoitteenne.

Kiitän arvokkaista vastauksistanne!

Mikko Luukkanen
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Markkinoinnin ja johtamisen laitos

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Gsm: 040 547 8820

Pyydän teitä antamaan kyselyn aluksi seuraavat taustatiedot.

Yrityksenne nimi?

Asemanne yrityksessä? *
toimitusjohtaja
hallituksen puheenjohtaja
ylempi toimihenkilö myynnissä
ylempi toimihenkilö ostossa
ylempi toimihenkilö tuotannossa
toimihenkilö myynnissä
toimihenkilö ostossa
toimihenkilö tuotannossa
muu, mikä?

Ikänne?
alle 20
20 – 30
31 – 40
41 – 50
51 - 60
yli 60

Koulutuksenne?
peruskoulu

lukio
ammatillinen oppilaitos
alempi kaupallinen korkeakoulu
alempi teknillinen korkeakoulu
alempi muu korkeakoulu
ylempi kaupallinen korkeakoulu
ylempi teknillinen korkeakoulu
ylempi muu korkeakoulu

Yrityksenne liikevaihto edelliseltä tilikaudelta?
vastaus tuhansina euroina

Vastauksen tulee olla numero

Miten yrityksenne liikevaihto on kehittynyt verrattuna 3 vuoden takaiseen?
laskenut selvästi
laskenut hieman
pysynyt ennallaan
kasvanut hieman
kasvanut selvästi
kasvanut moninkertaisesti

Miten uskotte liikevaihdon kehittyvän tulevan 3 vuoden aikana nykyiseen verrattuna?
laskee selvästi
laskee hieman
pysyy ennallaan
kasvaa hieman
kasvaa selvästi
kasvaa moninkertaisesti

Yrityksenne nettotulos edelliseltä tilikaudelta?

Syöttäkää tappiollinen tulos miinus-etumerkillä.

vastaus tuhansina euroina

Vastauksen tulee olla numero

Miten yrityksenne nettotulos on kehittynyt verrattuna 3 vuoden takaiseen?
laskenut selvästi
laskenut hieman
pysynyt ennallaan
kasvanut hieman
kasvanut selvästi
kasvanut moninkertaisesti

Miten uskotte yrityksenne nettotuloksen kehittyvän tulevan 3 vuoden aikana nykyiseen verrattuna?
laskee selvästi
laskee hieman
pysyy ennallaan
kasvaa hieman
kasvaa selvästi
kasvaa moninkertaisesti

Onko yrityksenne?

1) Lopputuotevalmistaja = omat tuotteet, joiden myynnistä tulee valtaosa liikevaihdosta
2) Järjestelmätoimittaja = valtaosa liikevaihdosta tulee kokonaisuuksien toimittamisesta suoraan lopputuotevalmistajille
3) Alihankkija = valtaosa liikevaihdosta tulee komponenttien toimittamisesta edellä mainituille ja toisille alihankkijoille
lopputuotevalmistaja (päähankkija)
järjestelmätoimittaja (1.tason toimittaja)
alihankkija (2. tai 3. tason toimittaja)

Käyttääkö yrityksenne ulkomaisia konepajavalmistuksen sopimusvalmistajia/alihankkijoita?
kyllä
ei

Kuinka suuri osuus konepajavalmistuksen ostovolyymista € kohdistuu ulkomaisiin toimittajiin (%)?
0 - 5 %
5,1 - 10 %
10,1 - 25 %
25,1 - 40 %
40,1 - 60 %
yli 60 %

Miten ulkomaisten toimittajien osuus kaikesta konepajavalmistuksen alihankinnastanne on kehittynyt verrattuna 3 vuoden takaiseen?
laskenut selvästi
laskenut hieman
pysynyt ennallaan
kasvanut hieman
kasvanut selvästi
kasvanut moninkertaisesti

Miten uskotte ulkomaisten toimittajien osuuden kehittyvän tulevan 3 vuoden aikana nykyiseen verrattuna?
laskee selvästi
laskee hieman
pysyy ennallaan
kasvaa hieman
kasvaa selvästi
kasvaa moninkertaisesti

Kuinka monta konepajavalmistuksen sopimusvalmistajaa/alihankkijaa yrityksellänne on (mahdollisimman tarkasti)? *
*
Vastauksen tulee olla numero

Miten käyttämienne konepajateollisuuden sopimusvalmistajien/alihankkijoiden määrä on kehittynyt verrattuna 3 vuoden takaiseen? *
laskenut selvästi
laskenut hieman
pysynyt ennallaan
kasvanut hieman
kasvanut selvästi

kasvanut moninkertaisesti

Miten uskotte käyttämienne konepajateollisuuden sopimusvalmistajien/alihankkijoiden määrän kehittyvän tulevan 3 vuoden aikana nykyiseen verrattuna? *
laskee selvästi
laskee hieman
pysyy ennallaan
kasvaa hieman
kasvaa selvästi
kasvaa moninkertaisesti

Kuinka suuri osuus konepajavalmistuksen ostovolyymista € kohdistuu suurimmalle sopimusvalmistajalle/alihankkijalle (%)? *
0 - 5 %
5,1 - 10 %
10,1 - 25 %
25,1 - 40 %
40,1 - 60 %
yli 60 %

Miten suurimman sopimusvalmistajan / alihankkijan osuus ostoista on kehittynyt 3 vuoden takaisesta? *
laskenut selvästi
laskenut hieman
pysynyt ennallaan
kasvanut hieman
kasvanut selvästi
kasvanut moninkertaisesti

Miten uskotte suurimman sopimusvalmistajan / alihankkijan osuuden kehittyvän tulevan 3 vuoden aikana nykyiseen verrattuna? *
laskee selvästi
laskee hieman
pysyy ennallaan
kasvaa hieman
kasvaa selvästi
kasvaa moninkertaisesti

Valitkaa alta "lopputuotevalmistaja" jos vastasitte aiemmin yrityksenne olevan lopputuotevalmistaja. Jos yrityksenne on järjestelmätoimittaja/sopimusvalmistaja, jatkakaa valitsemalla "järjestelmätoimittaja". *
lopputuotevalmistaja
järjestelmätoimittaja

Onko yrityksellänne suoria ulkomaisia asiakkaita? *
kyllä
ei

Kuinka suuri osuus liikevaihdosta € tulee suorista ulkomaisista asiakkaista (%)? *
0 - 5 %
5,1 - 10 %
10,1 - 25 %
25,1 - 40 %

40,1 - 60 %
yli 60 %

Miten suorien ulkomaisten asiakkaiden osuus liikevaihdosta on kehittynyt 3 vuoden takaisesta? *
laskenut selvästi
laskenut hieman
pysynyt ennallaan
kasvanut hieman
kasvanut selvästi
kasvanut moninkertaisesti

Miten uskotte suorien ulkomaisten asiakkaiden osuuden liikevaihdosta kehittyvän tulevan 3 vuoden aikana nykyiseen verrattuna? *
laskee selvästi
laskee hieman
pysyy ennallaan
kasvaa hieman
kasvaa selvästi
kasvaa moninkertaisesti

Kuinka monta asiakasta yrityksellänne on (mahdollisimman tarkasti)?

Vastauksen tulee olla numero

Miten asiakkaiden määrä on kehittynyt 3 vuoden takaiseen verrattuna? *
laskenut selvästi
laskenut hieman
pysynyt ennallaan
kasvanut hieman
kasvanut selvästi
kasvanut moninkertaisesti

Miten uskotte asiakasmäärän kehittyvän tulevan 3 vuoden aikana? *
laskee selvästi
laskee hieman
pysyy ennallaan
kasvaa hieman
kasvaa selvästi
kasvaa moninkertaisesti

Kuinka suuri osuus liikevaihdosta € tulee suurimmalta asiakkaalta (%)? *
0 - 10 %
10,1 - 25 %
25,1 - 40 %
40,1 - 60 %
60,1 - 80 %
yli 80 %

Miten suurimman asiakkaan osuus liikevaihdosta on kehittynyt 3 vuoden takaisesta? *
laskenut selvästi
laskenut hieman
pysynyt ennallaan
kasvanut hieman

kasvanut selvästi
kasvanut moninkertaisesti

Miten uskotte suurimman asiakkaan osuuden kehittyvän tulevan 3 vuoden aikana nykyiseen verrattuna? *
laskee selvästi
laskee hieman
pysyy ennallaan
kasvaa hieman
kasvaa selvästi
kasvaa moninkertaisesti

Kuinka monta uutta asiakasyritystä yrityksenne sai viimeisen 12 kuukauden aikana? *
menetimme asiakkaita
vähensimme asiakkaiden lukumäärää tarkoituksella
0
1
2 - 5
6 - 10
11 - 20
yli 20

Kuinka monta uutta asiakasyritystä uskotte yrityksenne saavan tulevan 12 kuukauden aikana? *
menetämme asiakkaita
vähennämme asiakkaiden lukumäärää tarkoituksella
0
1
2 - 5
6 – 10
11 – 20
yli 20

Kuinka suuri osa yrityksenne kaikista asiakassuhteista on mielestänne taloudellisesti kannattamattomia (%)? *

Selite asiakassuhteen kannattamattomuudelle:
asiakassuhteen tuomat tulot < asiakassuhteen hoitamisen kulut + vaihtoehtoiskustannukset
kaikki asiakassuhteemme ovat kannattavia
alle 10 %
10,1 - 20 %
20,1 - 35 %
35,1 - 50 %
yli 50 %

Onko yrityksellänne aktiivisessa käytössä työkaluja ja malleja asiakassuhteiden kannattavuuden arviointiin? *
kyllä
ei

Lopuksi pyydän teitä vastaamaan kolmeen lyhyeen avoimeen kysymykseen, jotka ovat tutkimuksen kannalta erittäin tärkeitä. Nämä kysymykset käsittelevät omaa näkemystänne yrityksenne ja koko toimialan tulevaisuudennäkymistä.

Miten kuvaisitte yrityksenne nykyistä liiketoimintastrategiaa?

Mitä uskotte suomalaisessa konepajateollisuuden yrityskentässä tapahtuvan maailmantalouden avautuessa ja teknologioiden kehittyessä tulevan 10 vuoden aikana?

Mitä mielestänne konepajateollisuuden alihankkijoiden ja järjestelmätoimittajien tulisi tehdä varautuakseen parhaiten kuvaamaanne muutokseen?

Syöttäkää tähän sähköpostiosoitteenne mikäli haluatte tutkimusyhteenvedon lähetettävän teille

Kysely on päättynyt. Yhteenveto tutkimuksen tuloksista tullaan lähettämään teille sähköpostitse alkusyksystä, mikäli annatte sähköpostiosoitteenne yllä olevaan kenttään.

Poistukaa kyselystä painamalla alla olevaa "Lähetä" painiketta, jonka jälkeen voitte sulkea selaimen.

Kiitokset ajastanne ja arvokkaista vastauksistanne!

Ystävällisin terveisin

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